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Cincinnati

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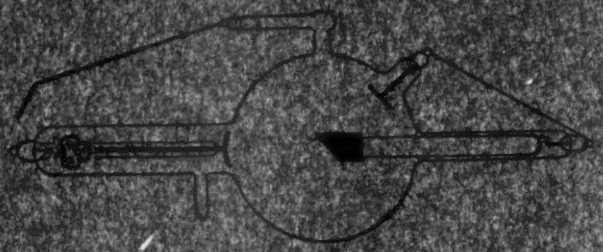

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The Executive Committee hereby approves the above application.

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ANNOUNCEMENT

The next meeting of the American Roentgen Ray Society will be held in Cincinnati, October 2nd, 3rd, and 4th, at the Grand Hotel.

The Grand Hotel is located on the south-west corner of Fourth Street and Central Avenue.

Arrangements have been made whereby the Convention Hall, the Exhibit and board and rooms for the members are furnished under one spacious roof. There will be ample accommodation for all upon either the European or the American plan. The rates for the latter will be three dollars a day up.

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Lantern slides are expected to be an important feature and every arrangement for this has been made. The lantern is of the best and the hall can be perfectly darkened.

Any suggestions from members which are intended to add to the success of the Convention, or to the comfort or pleasure of those attending can be sent to

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PRELIMINARY PROGRAM OF THE CINCINNATI MEETING.

SENILITY AND ITS ROENTGENOLOGICAL ASPECTS.

Dr. Percy Brown, Boston, Mass.

SPECIFIC IMMUNITY AND X-RAY THERAPEUTICS.

Dr. A. W. Crane, Kalamazoo, Mich.

SUPERIOR RESULTS IN FRACTURES OBTAINED BY RADIOGRAPHIC EXAMINATIONS.

Dr. Arthur Holding, Albany, N. Y.

THE EARLY RADIOGRAPHIC DIAGNOSIS OF PULMONARY TUBERCULOSIS.

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REPORT OF CANCER CASES TREATED WITH THE X-RAY AND COMMENTS THEREON.

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PROTECTION OF THE PATIENT.

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THE HISTOGENESIS AND DIAGNOSIS OF BENIGN BONE CYSTS.

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PRELIMINARY REPORT UPON A MORE RATIONAL METHOD OF TREATING LEUKEMIA BY THE X-RAY.

Dr. Henry K. Pancoast, Philadelphia, Pa.

A FURTHER STUDY OF THE ACTION OF X-RAYS IN LEUKEMIA.

Dr. Joseph F. Smith, Chicago, Ill.

LANTERN SLIDE DEMONSTRATION OF SOME TYPES OF ARTHRITIS.

Dr, Albert H. Freiberg, Cincinnati, Ohio.

MARKING AND STORING NEGATIVES.

Dr. W. S. Newcomet, Philadelphia.

AN X-RAY UNIT DEMONSTRATED BY A STANDARDIZED METER.

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EDITORIAL DEPARTMENT

In a conversation which the writer had a few days ago with a gentleman who took up X-ray work a few months after its introduction, we were struck with the slowness with which the profession took hold of the new discovery. Although the gentleman just referred to installed a very efficient outfit for those days, yet he did not have a call once a month for its use, although located in a large city. Physicians refused to believe that the findings upon the plate were accurate enough to base surgical proceedures upon. The writer remembers showing a print of a stone in the kidney some years ago to a prominent surgeon who at once expressed his contempt for such a method of diagnosis; two years later the same surgeon read a paper before his state society in which he advocated the use of the Roentgen ray as the most reliable proceedure in determining the presence or absence of renal calculi. All of which goes to show that the profession must be instructed in the uses of the ray and have its efficiency demonstrated. The obligation of this teaching rests upon those whose special line of work and experience makes them familiar with these technical findings. Writing papers to be read before local societies, the sending out of reprints which are well illustrated all serve to disseminate the knowledge of the usefulness of Roentgen proceedures, both diagnostic and therapeutic.

It is hardly part of the duties of the editor to call attention to the necessity of prompt payment of dues. A moment's reflection is sufficient to show that the work of a large society cannot be carried on without the substantial co-operation of all its members.

A discussion which is accompanied by lantern slides is usually intelligible without long explanations as well as being much more forceful.

The college catalogues which have come to hand show that many of the leading colleges in the country are recognizing the importance of Roentgenology as shown by the appointment of professors of this particular department. With this subject taught to the students who are taking

their medical work, the future recognition of the importance of Roentgen diagnosis and therapy is assured. The indifference and ignorance of the older medical men is to be replaced with the proper training and education of the future medical generation.

We are glad to note the arrival of a special exhibit prepared for our annual meeting by Dr. Alban Koehler, of Weisbaden. This noted Roentgenologist, with whose published works our readers are doubtless familiar, has sent a very interesting collection of prints illustrating many of the common and rare pathological conditions of the hip. In addition he has sent a cinetographic film which illustrates the physiology of normal respiration. The description of the process by which this film was obtained will be given when the moving pictures of respiration are thrown upon the screen. Arrangements have been made by Dr. Lange, of the local committee of arrangements, to have the film properly demonstrated at our annual meeting.

The approaching meeting at Cincinnati on October 2, 3 and 4, promises to be largely attended, and the various committees in charge of the different features of entertainment have arranged a comprehensive and instructive program. The benefits which will accrue to those who will attend these sessions will be hard to calculate. Roentgenology is a science which is young, its literature as yet comparatively scant, and its developments so rapid that the average worker finds it greatly to his advantage to be brought in contact with his co-workers. Much of the good to be derived from attending will come not only from the hearing of formal papers and discussions, but also from the opportunities of free and informal talks with fellow workers.

The favorable comments which have been bestowed on the Quarterly would seem to warrant its continuation. The arguments which favored its establishment, namely, a means by which the members of the society could be kept in touch with the proceedings of the society, still hold true. The policy of its future management, the problems of its financial foundation are matters for the members to decide. From many standpoints, the editorship should be distinct from the other offices, from the standpoint of convenience

the business managership should be combined with the office of treasurer. As the Journal becomes better known, many of the present problems of finance will be more easily solved.

If the plans of the print committee are fulfilled and their expectations realized, the members will soon have the opportunity of studying a large collection of instructive negatives. It would indeed be a work of which the members of this society might be proud if a proper selection of these contributed could be made and suitable reproductions provided which could be issued perhaps in the form of a supplement to the Quarterly. In this way an atlas of sarcomata of bone, of renal calculi and of tuberculosis of the joints could be gotten together which would be of the greatest value.

NEW METHOD OF USING ROENTGEN RAYS.

By A. Howard Pirie, London, Eng.

Pirie took 1 c.c pipette about a foot long, divided into 100 divisions, melted one end and blew a bulb on it about the size of a pigeon's egg. Two platinum wires were let through the glass of the bulb and sealed into the glass, so that their free ends project into the interior of the bulb without touching each other. The bulb was then filled with tap water. A drop of water is placed in the lumen of the tube opposite the divisions. This drop adheres to the walls of the tube by capillary attraction. This Pirie calls the indicator drop.

The instrument is then placed in series with the X-ray tube, and the current which flows through the X-ray tube flows through the water in the bulb between the platinum wires. This flow of current decomposes the water in the bulb and bubbles of gas are seen to rise from the platinum wire. These bubbles collect in the lumen of the tube and so force the indicator drop to rise.

When a child's scalp is placed at 15 c. c. from the source of the X-rays while this instrument is in series with the X-ray tube, and the indicator drop has risen 11½ divisions, then the scalp has received a standard dose of X-rays and epilation will follow. Pirie has produced epilation in 3 minutes and in 20 minutes trusting simply to the quantimeter, which measures total quantity that has passed in a given time.

AMERICAN
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Volume I JULY 1907 Number 4

THE DIFFERENTIAL DIAGNOSIS OF THE CHRONIC NON-TUBERCULAR JOINT DISEASES BY MEANS OF THE ROENTGEN RAY.

Robert B. Osgood, M. D., Boston, Mass.

It is with many apologies that I intrude a more or less clinical paper on this Congress of Technical Roentgen Ray workers. I believe, however, that no matter how great the progress in Technique may be, we must always consider Roentgen work the servant of clinical medicine, and must ever hold the accurate interpretation of our plates of as great importance as the perfection of the process.

We hear much of Tuberculosis and of its prevalence; we are told that Pneumonia almost heads the list of diseases in the extent of its inroads. And yet we venture the opinion that there are as many patients who are afflicted with "Rheumatism" as there are who suffer from the Great White Plague, or succumb to Pneumonia.

The word "Rheumatism," as Painter has said, is often a cloak behind which much diagnostic incapacity hides itself.

It satisfies the patients, for the multiplicity of its manifestations is proverbial, and the physician feels that, having called something which he does not understand by an accepted medical name, he has a perfect right to begin the administration of the salycilates which are questionably Specific in one form.

All careful observers are agreed that the word "Chronic Rheumatism" is an almost useless term, and, if used at all, should be confined to the description of a

great class of diseases of chronic nature affecting the joints, in the same way in which we speak of the Exanthemata or the Thoracic diseases.

Types of this great class of joint trouble can be separated as easily as Scarlet Fever can be differentiated from Diphtheria, and, except for the one common factor of joint affection, are quite as distinct diseases.

This paper will not concern itself at all with the treatment of these conditions. Its aim is to describe gross clinical differences, to discuss briefly a classification, which although by no means perfect. offers an opportunity for intelligent study, and to point out the value of the Roentgen Ray as a method of diagnosis.

Most of the lantern slides are from the collection of Dr. Joel E. Goldthwait, who was among the earliest in this country to point out the clinical separateness of the types. The writer and his assistants have taken the Roentgenographs, and had the opportunity to see the clinical as well as the Roentgen Ray course of the disease.

Lantern slides are at best imperfect illustrative media, and many of the original plates have little merit as examples of the skiagrapher's art, but if they make clear the suggested method of classification, and serve to demonstrate the essentials in the interpretation of plates, they will, perhaps, have justified their showing.

Opportunity for clinical observation is usually the forerunner of better understanding of obscure conditions. This was true of the cases of chronic non-tuberbercular joint affections. It is the prevalence of these chronic rheumatic lesions, their unsatisfactory treatment, and the imperfect comprehension of their nature and pathology, that has led a group of orthopedic men to more carefully study these joint deformities, although they should be, perhaps, more fittingly the problems of internal medicine.

Adult Orthopedics is an infant specialty, but its creepings will soon become, we believe, the walk of a full-grown being. It has not progressed far, but necessity has developed it, and the profession generally welcomes it, glad to see a confused mass of cases differentiate itelf into comprehensible and partly classified groups.

Practically all observers of chronic joint conditions early become aware of the fact that "Arthritis Deformans" includes many distinct types. Schüller, Pribram, Bannatyne, Still describe one or more types which

they consider separate conditions, or different manifestations of the same disease. Whether these types are absolutely distinct, and whether the etiologic factors in the different types are also separate, matters little to us as Roentgen Ray workers. If a type of chronic Rheumatism has a certain consistent clinical picture which remains constant throughout its course, if, at the same time, its pathology, studied from fresh specimens, is also constant in the essentials, and if, most important to us, the Rontgen plates show constantly the same bone processes, the type for us may be classified as a separate disease.

That we can thus separate Chronic Rheumatism into more or less intelligible classes, we hope to be able to show you. As has been intimated above, the classification which is proposed was first suggested by clinical observation.

Villous Arthritis.

There were certain joints frequently seen in which the function was impaired and pain was present, but associated with which there was practically none of the constitutional disturbance which we associate with Arthritis Deformans. Trauma, joint strain from faulty weight bearing, etc., were etiologic factors, and the lesion from palpitation and subsequent joint section was found to be a proliferation of the synovia, or the intrusion of the periarticular fat, producing a villous arthritis or the so-called Lipomata Arbosescens. That these cases often existed independently of any other more subtle joint change was soon evident.

The mistake must not be made of thinking of this condition of villous arthritis as a separate entity, for its etiology is too varied, and its association with many or all of the more distinct pathologic types is common. It needs, nevertheless, a separate mention since it may exist independently of the other types.

Atrophic Arthritis.

There were some cases, however, which soon grouped themselves together more consistently. The typical picture was a poorly nourished individual, more commonly of the feminine sex, who, in early adult life, very frequently after mental or physical strain, began slowly to develop polyarticular swelling and pain. The hands and the carpal, metacarpal-phalangeal and mid-phalangeal joints of these were usually first affected. The disease

had remissions and exacerbations, but ran a progressive course, now slowly, now rapidly.

These were the cases of subacute Rheumatoid Arthritis of Bannatyne.

The essential feature, as the disease declared itself, both clinically, pathologically and in the Roentgen plates was a loss of cartilage substance, erosions of cartilage and bone, and a diminution of lime salts, in other words, an atrophy; hence because of its essential feature, it was called Atrophic Arthritis.

Hypertrophic Arithritis.

Of nearly equal frequency, another class separated itself. The individuals were as a rule well nourished, heathful appearing types, more commonly in the last three decades of life, and having led lives of considerable activity.

The condition was more insidious in its onsets, and more gradual in its progression, though not without exacerbation.

The lesion was, perhaps as often monarticular in symtoms as polyarticular, though careful examination usually revealed a similar condition in other joints perhaps symptomless. The Herberdens nodes of the terminal phalanges represent the most obvious lesions of this class.

These were the cases of "Chronic Rheumatoid Arthritis of Bannatyne, The Osteoarthritis of many writers, and The Osteoarthritis Deformans of Pribram.

The essential feature here, both clinically Pathologically and in the Roentgen plate was thickening of cartilage, overgrowth of bone, and an increase in the deposition of lime salts. Hence, from its essential feature, it was called Hypertrophic Arthritis.

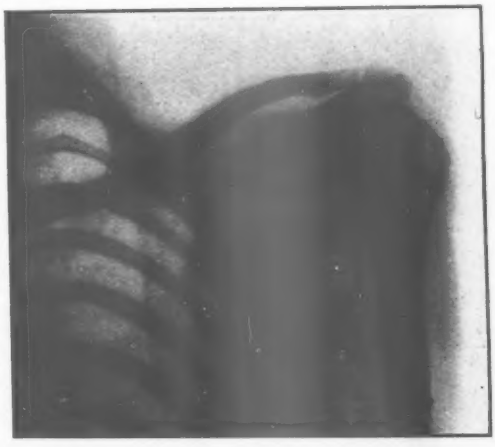
Infectious Arthritis.

For a considerable period these two classes alone were studied, but as soon as a careful analysis of each case came to be made, and as soon as the general medical men began to refer more of the chronic joints for an orthopedic opinion, cases were met which conformed to neither of these types.

The joints following Gonorrhoeic infection had been, for a long time, familiar; the development of certain cases of acute articular Rheumatism, into Chronic Polyarticular Rheumatism, was a well-known fact, and the joint sequellae of Scarlet Fever, Typhoid, Pneu-

HYPERTROPHIC ARTHRITIS.

Spicule seen on patella, on femur and head of tibia.



INFECTIOUS ARTHRITIS.

Severe infectious process in shoulder following erysipelas. Firm fibrous anchylosis, but no destruction of bone, erosion of cartilage or hypertrophic process present.

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monia, Grippe, Tonsillitis, and Dysentery were realized to be far more common than the literature would lead one to suppose.

When these joint inflammations went on to pus formation, and actual sepsis ensued, articular changes of all sorts occurred. In the vast majority of cases, however, no such acute processes ensued, and the striking characteristic of these chronic joints aside from their periarticular and articular swelling, the general constitutional disturbance, the frequent glandular involvement and the atrophy of disuse was the entire absence of either the atrophy or hypertrophy of the articular surfaces proper, which changes formed the basis of the distinction between the two previous classes. In this great group came most of the Chronic Rheumatism of literature, Still's disease, and the frequent sporadic cases of chronic joint disease in which special organisms have been found.

For lack of a better name, these cases were called Infectious Arthritis, including under that head not only the direct joint infections, but also the joint disturbances resulting from some vitiation of the blood stream due to the elaboration of toxines, from some focus of infection in the body, as, for example, the tonsils, or from some disturbance of metabolism, glandular or otherwise.

The name Infectious Arthritis has an etiologic significance, while atrophic and hypertrophic arthritis are descriptive of the Pathologic findings. As we progress in our study of these infectious forms, and learn the essential pathologic feature of the various infections, we must hope for names which will be here too pathologically descriptive. At present they are grouped together simply for purposes of study, and to separate them from the two preceding types.

Gout.

There yet remains one type, older than any of the previous classes, which we must briefly mention, since it comes under the general heading of chronic nontubercular joint lesions.

Gout is too well recognized, and has been too thoroughly studied, to need more than mention in such a superficial paper as this. The tophi are its most striking characteristic, and the Roentgen Ray pictures almost diagnostic by the early loss of bone tissue in the shafts as well as by the articular lesions.

The object of this rough classification, as has been stated above, is for purposes of study. It is evident to all who have had any experience with chronic joint lesions, that only by thus separating types can we satisfactorily investigate these perplexing conditions.

Without attempting even to outline our embryonic methods of treatment, it suffices to say that it has been proved that very different methods are applicable to the different types, and that these methods may be even, in the different types, diametrically opposite, as, for instance, motion and rest.

The prognosis also varies with the various classes, and it is due our patients to give them as clear a look into the future, as possible. Villous arthritis can be demonstrated by the Roentgen Ray perhaps in the future more perfectly by means of the oxygen injection.

It has seemed to us best to show the slides partly in series and partly in contrast in the atrophic and hypertrophic classes, believing that the essential differences will thus be more conclusively shown.

The infectious types differ so materially from both the atrophic and hypertrophic, in the absence of articular lesions, that these can be grouped together in the slides.

Gout rarely requires the Roentgen Ray for a diagnosis, but has essential features worth emphasizing.

Slides.

You have seen these imperfect reproductions, gentlemen, and I ask you to disprove or confirm these observations in your hospital and private practice.

To us these Roentgen Ray findings seem consistent with the clinical picture, and the pathologic examination.

They offer us at times the opportunity of an independent diagnosis, and always represent a piece of confirmatory evidence important to the physician and peculiarly satisfactory to the patient.

DISCUSSION ON DR. OSGOOD'S PAPER.

DR. GEORGE E. PFAHLER, Philadelphia:—I cannot confirm what Dr. Osgood has just told us, but I am much interested, and I would like to know how he explains the decalcification of the bone near these chronic joint lesions. For instance, in one of his pictures we could see the decalcification as compared with the rest of the bone. The shoulder joint, the outer third of the clavicle, the acromion process, and upper third of the humerus showed more transparency than the rest of the bone.

DISCUSSION OF DR. OSGOOD'S PAPER.

DR. PRESTON M. HICKEY, Detroit, Mich.:—I wish to give voice to my appreciation of the work shown us today. Without going into detail I will refer briefly to the great value of the X-ray in the diagnosis of certain diseases formerly classed as rheumatism. A case was brought into the Children's Hospital in Detroit, a young girl who had been treated for two years for chronic rheumatism. A clinical diagnosis was made of infectious arthritis, as the patient presented all the characteristic Roentgen appearances mentioned by Dr. Osgood.

DR. OSGOOD CLOSING THE DISCUSSION.

As to the decalcification of bone in the neighborhood of the joints occurring in these types of cases, I am not perfectly sure that the explanation which I offer is the true one. I have noticed it, however, not only in cases of these types, but in many others. I think it is due to disuse and to some possible neurotrophic disturbance, and not to the lesion in the joint.

The ends of the bones are naturally of finer structure and show trabeculation more clearly than do the shafts. It is here, therefore, that the first evidence of atrophy is seen. There will be certain difficulties encountered in attempting to separate these various types. Many pathologists, from examination of postmortem specimens, feel certain that the two processes of atrophy and hypertrophy are often found in the same specimens and they, therefore, conclude that these conditions which we have called "atrophic" and "hypertrophic" arthritis are simply different stages of the same disease. The explanation of this fact seems to us to lie along these lines.

In the body are constantly going on waste and repair processes; new bone is being formed; old bone is being carried away. Both atrophic and hypertrophic arthritis are characterized by periods of remission and exacerbation. If, for example, in an atrophic case with erosions of cartilage, a remission occurs, the normal repair processes going on, new bone will be formed at a point of erosion. In the hypertrophic type, also, we may conceive a spicule of bone to project until it impinges upon the cartilagenous surface opposite or anchyloses the joint, in which case there will naturally be found an erosion of cartilage, and perhaps atrophy from disuse.

The pathology, to be significant, must be studied in the fresh specimens, and only thus do we feel that an accurate opinion can be rendered as to the essential processes in these two types.

A ROENTGENOLOGICAL STUDY OF CERTAIN MANIFESTATIONS OF SYPHILIS.

Percy Brown, M. D., Boston.

A cursory glance at the title of this paper might easily convey the impression that it is to deal necessarily with a subject more of interest to the scientific observer than of practical value to the clinician. For the following reasons, however, the writer feels to some extent justified in presenting the subject of syphilis:

First. The tendency of medicine, in its various surgical branches, is more and more toward the accurate differential diagnosis between conditions, immediate and remote, obtaining in the bones and joints, which have hitherto been lazily grouped under the heading of "chronic rheumatism," and the symptoms of which, objective and subjective, have been encumbered with various names, ranging from "growing pains" to "paralysis." To aid us to escape across this stream of unenlightening generalities, the Roentgen Rays have cropped out as the most prominent stepping-stone, and it is not only with regard to subtle joint lesions, but also in the later and more obscure manifestations of syphilis, that they have become of really practical value. It is fortunate that this is so, for the knowledge of the existence of these manifestations is established by the Roentgen method at a period in the course of the affection when the results of visual and tactile examination are often most imperfect. To the syphilographer or surgeon the primary and early secondary picture is only too familiar at first glance; it is later in the course of a case, when the early history may be obscure, that the diagnostic method by X-Rays proves its worth.

Second. We have, fortunately, in syphilis, a method of treatment by drugs which is practically specific and almost always certain in its action; so much so, that the effect, or non-effect, of these drugs may be employed as a means of diagnosis, by the process of exclusion, in cases where other diagnostic methods may lead to imperfect conclusions. It must occasionally happen, then, that a person quite innocent of any infection is subjected to large doses of the iodide of potash for long periods of time to the extreme detriment of his digestive apparatus. If a definite understanding of the etiology in such a case can be come at by means of the Roentgen method, what is its value, if not prac-

tical? Also, if, as the writer is informed by a prominent syphilographer, certain cases never respond to treatment, is not the need of a careful Roentgen examination the greater?

A third reason, which might properly be a subdivision of the first, is that syphilis is an affection wherein an accurate previous personal history from the patient is either not obtained at all, or else given grudgingly, and the medical man is left quite in the dark as to the real cause of the pains and aches complained of months, or even years, after. The X-Ray plate, which can be made easily without exciting suspicion as to the exact reason for which it is made, will, however, instantly reveal what has been sought after by unavailing oral examination.

Fourth. After the diagnosis has been established, it is easy to observe, by means of subsequent Roentgen examinations, the progress of the disease or the regenerative effect of medication. Since proper treatment requires a long period of drug exhibition, such X-Ray exposures, for purposes of record, will be more numerous and consequently the more valuable.

It is for these reasons that the writer is of the opinion that the Roentgen method of diagnosis, as applied to cases of late acquired and congenital lues, is of definite practical importance, and should be employed in every suspected case both for the sake of the practitioner's enlightenment and for the patient's ultimate good.

The structures which, in syphilis, naturally present themselves for X-Ray examination are the bones and joints with their intimate appendages. It is well known that these are the tissues often affected in the third stage of the acquired and in the congenital forms of the disease. It has been said that the diaphyseal extremities of the long bones are the regions often affected in tertiary lues, but the tables of the skull are also very often involved, and less frequently the clavicles and ribs. It is the purpose of the writer briefly to consider the most important histological elements of the pathologic process and to describe their appearances as seen in the Roentgenograph.

The so-called bone gumma is the isolated lesion most frequently seen clinically. It is of an inflammatory nature, usually of subperiosteal origin, and if so,

its appearance is characteristic and easily to be recognized on the X-Ray plate. It appears as a localized swelling involving the periphery of the bone, over which the periosteum is thickened and irregular. The extraosseous soft parts may also be involved in the swelling. Gummata may, however, arise in the medulla, in which case they are to be diagnosticated by X-Ray only when they involve to a greater or less degree the endosteum. The endosteal foci may be simply discrete areas of endosteitis, or may amount to actual endostoses.

As the course of a luetic bone lesion advances, certain changes take place within and around the gumma which are easily to be recognized on the plate, and which I will attempt to demonstrate to you by means of these prints. For some of this material I am greatly indebted to Dr. Abner Post, of Boston. The Roentgenographs of the pathological specimens were made by me from some of those in the Warren Museum, of Harvard University.

Following the establishment of the inflammatory node, a caseous degeneration and resorption of the bone takes place, which may amount to an isolated erosion here and there, or to a most extensive caries, often followed by necrosis, honeycombing the bone about the area of infection, and resulting in the characteristic appearance as of coral formation which can be recognized from the X-Ray in certain cases. As a result of these profound inflammatory changes, numerous osteophytes are formed, giving rise to the characteristic dense hyperostoses, which are so commonly seen in the radiograph. The endosteal phenomena, briefly described above, may at the same time take place in varying degree, and the bone may acquire, at the expense of its normal cancellated structure, a condition of extensive sclerosis and eburnation. It sometimes happens that this condition of gummatous osteomyelitis and endosteitis results in bone rarefaction, followed by osteoporosis and a complete breaking down with the formation of sequestra.

These pathological processes, namely, gumma formation, resorption, caries, necrosis, hyperostosis and sclerosis present certain definite shadows which I have attempted in a measure to demonstrate and which, when observed and considered carefully, make up a complex seen in no other morbid condition.

An interesting form of syphilis, although less often intelligently observed, is that of the new-born. The

process in these cases, as seen by the Roentgen method, involves chiefly the diaphyses of the long bones, consequently giving to the bone cortex, at these points, a curiously laminated appearance, as if, in the early stages of ossification, the bone had been deposited in layers or strata. The condition of the diaphyses at the epiphyseal lines is also characteristic. The extreme margins present a serrated edge, which, in some cases, seems almost to approach a condition of fimbriation. These changes, taking place in the extremities of the diaphyses, lend an appearance of extreme disproportion in development between epiphysis and diaphysis. The relative infrequency of congenital cases recorded by Roentgen workers is due, I believe, more to the fact that, as such, they are not often referred to them, than because they are of infrequent occurrence.

Conclusive as the above group of appearances would seem to be, there are, nevertheless, certain chronic conditions involving bone which might, at first glance, lead the observer to think of syphilis, so far as the Roentgenographic appearances go. We should certainly class in this group old osteomyelitis, osteosarcoma, post-typhoidal periostitis, Paget's disease, and rhachitis.

The old osteomyelitis is to be recognized by the fact that, as a rule but one anatomical region is complained of and that its counterpart on the other side of the body, when Roentgenographed, presents no abnormality. In syphilis, on the contrary, both tibiae, for example, may be seen to be affected although but one may offer subjective symptoms. In osteomyelitis although there may be profound changes in the medullary canal, the thickening and sclerosis of the cortical layer is not so typical. In cases of marked syphilitic osteomyelitis, with sequestral formation, the differential diagnosis by means of the X-Ray plate, per se, may be extremely difficult, but an inquiry into the previous history will usually elucidate matters.

It is not, as a rule, so difficult to separate this condition from osteosarcoma. The immediate area occupied by a sarcoma is typical, and there is nothing in the gamut of the syphilis complex with which it could be confused, except possibly in a case where there were many confluent gummata with much osteoporosis. The usual lack of multiplicity of sarcomatous lesions may be a distinguishing factor, as is also the relative rapidity of their course.

Paget's disease of bone, or osteitis deformans, so-

called, may closely simulate syphilis, both objectively with regard to the patient, and on the X-Ray plate. It may involve counterparts; its development may be slow and its gross external appearances are often similar. On the Roentgenograph, however, the periosteum in Paget's disease has usually nothing of the roughened, thickened and exfoliated appearance of lues.

Post-typhoidal periostitis may be suspected from the history, obviously. In the cases seen by me its appearance in the plate is usually as a sharply localized raising of the periosteum, beneath which a typical vacuolous condition. There is generally little circumfocal disturbance.

It is possible to confuse congenital syphilis with rhachitis. In the Roentgenograph there is presented in both the same relative disparity between the lower ends of the diaphyses and the epiphyses. In rhachitis, however, the disturbance is at the epiphyseal line, and the hypertrophy of the diaphyseal ends is often one of abnormally active ossifying action therein. In syphilis, as has been said, the diaphyseal disturbance is one of hyperostosis and sclerosis.

Of less usual occurance, but withal presenting some of the most beautiful evidences of the syphilitic process to be seen on the Roentgenograph, are the arthropathies of nervous origin described by Charcot. These are seen often as one of the concomitants of tabes dorsalis, but are not necessarily well-marked in proportion to the stage of advancement of the disease. Since syphilis has now come to be considered seriously as the etiological basis in the majority of these cases, a description of the arthropathic condition may not be out of place in this paper.

The Roentgenographic plate of the "Charcot joint" presents, first, evidence of rarefaction and atrophy of the articular extremities, which sometimes amount to actual morphological change, resulting in subluxation or complete luxation; second, the more striking appearances of exuberant bone formation, which may involve the capsule and other synovia, the ligaments, tendons and muscle attachments. The pronounced character of these shadows, in a marked case, tends to cause an obliteration of the atrophy obtaining in the articular extremities. Accompanying this text is an illustration of the lateral aspect of the knee-joint in such a case, which I saw through the kindness of Dr. Charles F. Painter, of Boston. The typical changes are easily to be made out.

Very little may be said about technic in these cases of lues, for the procedures are usually simple enough. In congenital cases occurring in the very young, it may become necessary to employ an anaesthetic, for immobility is essential where a differential diagnosis of subtle lesions is to be made. The writer has found it very difficult to make a full-timed exposure in some cases of Charcot's joints, on account of the tremor which was met with. This tremor is especially hard to overcome in exposing the anteroposterior position of the knee-joint.

In conclusion, the writer would repeat and emphasize his previous declaration that to make Roentgen examinations in all suspected cases is very necessary. If, by so doing, the operator can relieve personal anxiety in determining a supposedly positive case to be negative, or, on the other hand, can open the road to proper medication and care in a given case by declaring it to be positive instead of negative, he has afforded himself an opportunity for eternal self-congratulation.

DISCUSSION ON DR. BROWN'S PAPER.

DR. HENRY K. PANCOAST, Philadelphia:—Dr. Brown's paper has been most instructive to all of us, and we will all agree that the prints he has shown in connection therewith are most excellent, and as they would undoubtedly be very valuable to us in the future for reference, it seems as though there should be some means of having them on record for the benefit of every one interested in this subject. Some plan ought to be adopted whereby such valuable skiagraphs could be included in our transactions. Dr. Johnston has suggested that all prints shown in connection with papers read at these meetings, and of sufficient value for reproduction, could be included in the transactions at an additional cost of one dollar per copy.

DISCUSSION ON DR. BROWN'S PAPER.

DR. GEORGE E. PFAHLER, Philadelphia: I want to emphasize what Dr. Pancoast said. During the past year I often felt the need of referring to the excellent work Dr. Hickey did in studying the epiphyses of the elbow joint, but unfortunately the prints were not available. This matter ought to be given some attention by the society. I for one would be very glad to pay one dollar for the volume of transactions if it contained these prints.

DISCUSSION ON DR. BROWN'S PAPER.

DR. FREDERICK H. BAETJER, Baltimore, Md.:—I was particularly interested in Dr. Brown's paper, because we see so many cases of syphilis in Baltimore. Before we had the X-ray so many of these cases were diagnosed as cases of osteomyelitis. Now we can diagnose them correctly, which has materially altered the treatment and, of course, the clinical result. When there is suppura-

tion, with bone being thrown off, unless very extensive, we do not do as we did before the time of the X-ray, do a radical operation, but we usually put them on the anti-syphilitic treatment, and we find that these cases do very well, the mild ones healing up very nicely. With the X-ray we can trace the course of the disease very nicely. I think that many cases of so-called osteomyelitis, if looked into with the X-ray, will turn out to be of syphilitic origin.

DR. BROWN, closing the discussion:—Dr. Wells's cases apparently are typical. They represent an appearance of the lesion which we may neglect to emphasize, namely, the persistence of the original bone cortex running through the lesion and the exfoliative appearance on the periphery, as if a person had taken a certain amount of Plaster-of-Paris and had moulded it about the bone.

As to the osseous involvement in cases of infection near the elbow joint. It seems to me that we should look first at the lower diaphyseal end of the humerus, and the upper diaphyses of the radius and ulna, for first evidences of the disease about this joint.

Dr. Baetjer's description of the practice, at Johns Hopkins, of opening up these lesions in cases where there is much purulent exudate seems to me to be an especially wise one, although syphilographers have been rather prone in the past to cast surgery aside, rather than to embrace it the proper course of anti-syphilitic medication.

THE TUBULAR DIAPHRAGM IN ROENTGENOGRAPHY OF THE CHEST.

By P. M. Hickey, A. B., M. D., Detroit.

The early interest of the writer in the Roentgen Ray had its origin in a desire to investigate its possibilities as an aid in the exploration of the chest. At first the fluoroscope seemed the most feasible way of utilizing the new force. Accordingly a room was planned which could be completely darkened, and an apparatus was installed which portrayed vividly on the screen gross lesions of the lung and permitted the excursion of the diaphragm to be watched and measured. When these phenomena were demonstrated to the experts in physical diagnosis, they would agree that the demonstrations were very interesting from a scientific point of view, but expressed their skepticism as to any real practical benefit in these new examinations of the lower respiratory tract. The clinician asked if tubercular changes in the pulmonary tissues could be detected earlier with the fluoroscope than by auscultation and percussion. We were compelled to admit that the new method was simply a confirmatory agent in establishing a diagnosis in respiratory lesions, although of paramount value in the investigation of the aorta and in the early diagnosis of aneurism.

With the improvement in apparatus, with stronger tubes and more powerful coils, the possibilities of rapid exposures became greater and the era of the fluoroscope was succeeded by the era of the plate. A negative could be made while the patient held his breath with results which depended on the quality of the tube employed. This technique seemed to be of marked value and to possess distinct advantages over the fluoroscopic examination. It furnished a means of studying in detail the appearance so evanescently depicted on the screen, and of making a permanent graphic record which could be compared with subsequent photographic observations at succeeding examinations. The experts in auscultation and percussion continued their attitude of skepticism as to the value of the Roentgen Ray when compared with what could be learned by the ear.

Let us consider for a moment how radiography of the thicker parts of the body has advanced. Formerly the hip and spine were the bete noir of the Roentgenographer; he rejoiced when called upon to show the ossoeus structures of the wrist or foot, but he found the cancellous tissue of the neck of the femur or the differentiation of detail in the lumbar vertebrae wonderfully elusive of representation on the sensitive film. The discovery of the injurous effect of the inverse discharge and that mist and fog were produced by the secondary rays led to the employment of the diaphragm. To Albers Schonberg we owe a great debt for the perfection and introduction of this important piece of apparatus. Thanks to Schonberg, the heavier parts of the body yield their records of density with the ease formerly characteristic of the thinner parts.

While we may be able by other means, such as careful adjustment of the vacuum of the tube and the use of mechanical interruptors, to eliminate many of the secondary rays, yet it remains a fact that the diaphragm is necessary with fast exposures. If a patient could immobilize his chest for one or two minutes by holding his breath for that length of time, the electrolytic interruptor could be replaced by the mechanical. In radiographing the chest, if the plate is to possess a maximum value, the exposure must be rapid so as to minimize movement. Movement is as fatal to fine definition in radiography of the chest as it is in the hand or elbow. The nearer we can attain to the instantaneous, the greater will be the diagnostic value of the resulting negative. Hence, if we desire to investigate the chest with an idea

of discovering changes not apparent to the experienced auscultator, we must minimize the time of exposure. Rapid exposures necessitate electrolytic interruptors, which in turn often involve secondary rays which require the diaphragm for their elimination. It must be apparent from a moment's reflection that if the diaphragm is useful in hip exposures, it should be useful in the chest, as the air in the lung delights in the formation of secondary rays.

The use of the diaphragm, and by this term the author means the tubular diaphragm of about 13 centimeters diameter, presupposes the use of small plates. Of a necessity, compression can be of little value in thoracic work. An 8x10 plate allows of an investigation of both apices so that the apex of one lung can be comtared with the apex of the other lung. The diaphragm permits of the careful investigation of the roots of the lung and their frequent glandular changes. We have found that the negative shows changes along the internal borders of the lungs more frequently than at the apex. Apical changes are frequently secondary to infection from the bronchial lymph glands. We believe, and in this belief we have the support of Dr. Schonberg, that the diaphragm will enable us to detect changes in the lung structures, particularly in the apices, before the stethescope can find a lesion.

Probably the part of the lung most frequently the seat of careful examination is the apex. Here we find Roentgenography of the greatest value. The procedure thus far found of value may be summarized as follows: The patient lies upon his back with only a thin support under his head. The hands are crossed over the abdomen so as to widen the space as much as possible between the scapulae. An 8x10 plate properly protected is placed underneath the neck so that the region of the apices may correspond to the plate. The diaphragm is moved as close to the neck as possible with the lower edge touching the lower surface of the chin. The angle of inclination will be adjusted so that the light axis is slightly oblique to the plate. The angle should be studied with reference to the shape and contour of each chest to be investigated. The best plates are those in which the shadow of the clavicles falls in the lower part of the third intercostal space and does not superimpose at all on the first and second intercostal spaces. To attain such plates each case must be individually studied and the diaphragm adjusted in a careful manner. If

Roentgenogram of pleural thickening on right side; this appearance should not be confounded with consolidation.

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the clavicular shadows cover the apices the value of the examination is lost. The nearer the light axis passes through the sixth cervical vertebra, the less will be the distortion.

With regard to exposure, it should be as short as possible, having due regard for proper penetration. Longer time seems to be required with the diaphragm than when the latter is not employed. The criterion of the developed plate must be fidelity of the rendition of the soft tissues and not of the bones. Negatives which may be brilliant in their display of the osseous structures may show little details in the pulmonary organs. The choice of a tube is probably the most important factor in the successful production of satisfactory chest negatives. A tube reading a full Walter five or a scant Walter six will have sufficient penetration for the apices of a thin chest. For a thick chest, a brilliant Walter six is necessary. In order to minimize the time of exposure, a tube of low internal resistance should be selected so that it will permit enough current to pass to cause the milliampere needle to read 10 milliamperes with a penetration of Walter six. This can be secured by a so-called seasoned Grundlach tube which, according to the writer's idea, simply means that the original molecules of oxygen and nitrogen have been absorbed by the terminals in the tube and replaced by hydrogen admitted through the osmosis regulator; after the substitution is complete, the internal resistance falls so that enough current is passed to do rapid work. Any modern coil will furnish all the current necessary if the tube will allow it to pass through. The exposure therefore is estimated by the Walter scale, the equivalent spark length and the milliampere reading.

After a plate has been made of the apices, the region to the right of the sternum can be rayed so as to investigate the root of the right lung. Here the light axis should be perpendicular to the plate. Similarly a plate may be made of the left lung. When this plate of the left side has been made, another will often be found advantageous in which the light axis is inclined from without inward so as to separate the aorta from its adjacent tissues. Plates should be exposed from back to front to render the examination complete.

In cases of advanced consolidation with cavity formation where it is desired to accurately determine the size and shape of the excavations, a time exposure may be necessary, unless all the conditions are favorable for

very rapid work. The density of the diseased tissue coupled with the difficulty of suspending respirations often prevent satisfactory penetrations, unless the tube is of the best. While there is usually no difficulty in recognizing by auscultation a cavity of appreciable size, the stereoscopic image gives us a concrete idea which is much more definite. The production of the two negatives upon a divided 11x14 plate so that each occupies a space 7x11 inches with subsequent fusion with a prism stereoscope possesses many advantages.

The practical results of this method are the successful demonstrations of pulmonary lesions when still unheard by the stethescope. Now that the importance of the early detection of a pulmonary tuberculosis is becoming universally acknowledged, this reliable means of early diagnosis should be welcomed. It furnishes an important means of investigation of the bronchial lymph glands, whose infection so often leads to adjacent contamination of the lung parenchyma.

It is not the intention in this brief paper to disparage the use of the fluoroscope or large plate as each method of examination has its advantages and limitations, but to suggest the small plate made with the diaphragm as the method which gives the greatest amount of information in regard to the density of the lung area investigated.

In the interpretation of the negative thus obtained experience and care are necessary. The position of the clavicles should be carefully noted and their sternal ends, which are somewhat indistinct, mapped out. The first rib on each side should be studied so as to find its anterior representation. These often cause some confusion. The edges and spines of the scapulae should be located. These few bony landmarks having been recognized, the attention can be turned to the intercostal shadings. The first intercostal space of one side can be compared with its fellow of the opposite side. Massive consolidation prevents any darkening of the intercostal space. Isolated tubercles of appreciable size are plainly depicted. Slight shadings, indicate slight increase in the pulmonary density. The shadings along the sternum in the 4th, 5th and 6th interspaces are often hard to interpret. Rounded dots often indicate enlarged glands, and should be differentiated from linear shadings suggestive of the pulmonary vessels.

In advanced cases the size of cavities is more easily made out than in the large plate. Thickening of the

Roentgenogram of Normal apices.
Patient lying on back with plate under neck.

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pleura causes a diffuse shading which must not be confounded with massive consolidation. These are nly a few suggestions as to conclusion. The Roentgenologist will, as his experience increases, naturally draw more extensive and more accurate conclusions from his plates.

The points to be emphasized may be grouped as follows:

First. The small negative made with a tubular diaphragm shows more detail of lung structure than the large general plate.

Second. The early changes in the tuberculosis of the lung are easily shown in the diaphragmed plate.

Third. The diaphragmed plate often is more accurate in detecting small areas of pulmonary change than the stethescope and often anticipates the latter instrument.

Fourth. The small diaphragmed plate while not to be advocated as replacing the large plate has a distinct field of usefulness.

DISCUSSION OF DR. HICKEY'S PAPER.

DR. KENNON DUNHAM, Cincinnati, Ohio:—Dr. Hickey has given us some very beautiful work which will help in the diagnosis and treatment of tuberculosis. In treatment results depend upon an early diagnosis, and here accuracy is everything.

I believe that this work will lead to a great deal of just such discussion as we have had. What are the shadows? What do they mean? That is why we must be extremely careful in interpreting our plates. For several years I have been making plates of the lungs, not for the purpose of making a diagnosis, but as a confirmation of what I see with the fluoroscope. I started in to examine chests with the fluoroscope after Williams' book appeared. The longer I worked the more impressed I became with the value of the fluoroscopic examination of the chest. My pictures were taken somewhat differently from Dr. Hickey's technic, but it was done more as a confirmatory work than as a means to absolute diagnosis. The technic I used was not nearly so good. I see now what was wrong.

The picture was made with the chest to the plate and the arms in the position of a swimmer, and I got the clavicle over the apex. That was a mistake. The clavicles must be down in the intercostal space, as Dr. Hickey told us, because the place where we look for the first evidence of the disease is in the apex of the lung and just beneath the clavicle. However, if you do not lose sight of the valuable work done by Williams, you will get a very great deal of information from the fluoroscopic examination. I have often demonstrated the possibility of making a diagnosis of the presence of tuberculosis from three to six months prior to the clinical diagnosis. If I make a careful fluoroscopic examination, and can confirm these findings with my plates, I feel that I have

made as sure a diagnosis of tuberculosis as finding the bacilli microscopically would give me.

DISCUSSION ON DR. HICKEY'S PAPER.

DR. GEORGE E. PFAHLER, Philadelphia:—My technic corresponds almost exactly with that of Dr. Hickey, and, I think that I can say pretty definitely that with the X-ray and careful technic you can make a diagnosis of tuberculosis of the lungs earlier than you can by any other means. I have had the opportunity of measuring, side by side, my ability in this direction with some of our best clinicians, and the latter recognized the superiority of the X-ray over the usual clinical methods.

I have always felt that the fluoroscope is a good thing, but I recognize most distinctly that it is a dangerous thing. That is why I have practically discarded it. The use of the fluoroscope is not necessary when you can learn all you need to know or want to know about the lungs if you will employ the excellent technic of examination that Dr. Hickey has described to us. By first exposing the whole chest and then a certain part of which you may want more definite information, you can make a permanent and accurate record, one that is far ahead of any fluoroscopic examination and without any danger to yourself or to the patient.

DISCUSSION ON DR. HICKEY'S PAPER.

DR. MIHRAN K. KASSABIAN, Philadelphia:—In 1902 I reported at the Congress of Tuberculosis, in New York, on the value of the X-rays as a means of diagnosis in the incipient stages of tuberculosis, and I had the privilege of making examinations at the Medico-Chirugical Hospital, Philadelphia, with the best clinicians in the country. At that time I used to expose the chest for from three to four minutes. My report embodied about ten cases, which were diagnosed with the fluoroscope and skiagraphically in the pre-bacillary stage, and my diagnosis was confirmed afterward. Although we do not expose so long now, still we get the same results.

When both apices are involved it is very difficult to make a diagnosis because we have not a normal side with which to make a comparison, and the apices of the lung cannot be compared with the lower portions so far as transparency is concerned.

With regard to the light spot in one of the negatives, I think that the darker spot is due to an emphysematous condition of the lung on the unaffected side, because when the apex is involved the diaphragm on the affected side becomes less mobile, and therefore that side of the lung becomes emphysematous. This gives us these darker spots representing lung tissue that contains more air than the other side.

I would like to ask Dr. Hickey about the immobility of the diaphragm on the affected side. That has not been explained by anyone as yet. It is considered a sign of pulmonary tuberculosis, but the reason for its existence has not been explained. I also believe that a pleurisy throws an equal or less shadow than the rib; that is, the shadows of the ribs are visible when the pleuritic thickening exists; but when consolidation exists in the lung, the shadows of the ribs are obscured.

DISCUSSION ON DR. HICKEY'S PAPER.

DR. A. CLIFFORD MERCUR, Syracuse, N. Y.:—It seems to me that it is interesting to remember that one reason why the photographic result is better than the visual result is the fact that the same portions of the retina are not involved in day vision and in night vision. In recent physiologies it is stated that we use different histologic elements in our night vision, and that night vision, therefore, is far inferior to day vision. Accordingly as fluorescent examinations are best made under conditions of night in a dark room, we never can expect to see the definition on the screen, even if it is there, that we see in photographs.

An interesting matter which has come out in connection with this lung matter is that Dr. Lawrence Brown, of Syracuse Lake, N. Y., has learned to percuss on inspiration and expiration and get the same results as he does in his X-ray pictures. He is able to determine the movement of the diaphragm by percussion, as well as he can determine it by the X-ray picture. He has carefully compared the two methods.

Another thing; we are talking about making the earliest possible diagnosis of tuberculosis with X-ray. I believe that the time is coming when this will all be put aside for the tuberculin test, the only sure test in doubtful cases.

DISCUSSION ON DR. HICKEY'S PAPER.

DR. HENRY HULST, Grand Rapids, Mich.:—The diaphragm motion which has been mentioned, the so-called Williams' sign, frequently occurs in other affections, which are not related to tuberculosis in any way. Thickening of the pleura is very apt to deceive, but after all a local thickening of the pleura at the apex, nine times out of ten, indicates tuberculosis.

The first picture Doctor Hickey showed has less penetration on the left than on the right side. We have noticed this even when there is no disease of the lung. Turning of the body around its long axis will change the relative density. The difficulty in studying a fine plate is to see only what is really there and not to see too much. In order to get detail we must have the patient quiet and at rest. That applies to all skiagraphy.

A quick exposure by itself, irrespective of the immobilization of the diaphragm or the lung produces results. The finest detail is secured with the quickest exposure. If you can make a picture in a fraction of a second it is better than in a second. By long exposure of the lung with the compressing tube you lose what you might gain by shortness of exposure without the compressor.

I have not done such work with this diaphragm as has Dr. Hickey. If you want to study a cavity well, it does add to the beauty of the work. You can get just as good detail in your finest picture without using this compressor-diaphragm, provided you go at it rapidly.

When you can find the bacillus with the microscope, the use of the X-ray is limited to determining the extent of the disease. To determine the question of lung tuberculosis in the prebacillary stage, before the bacillus is found in the sputum, is always ticklish work. To make a diagnosis at that time from the plate requires a good deal of experience. Sometimes you will get a case in which the bacillus is not found in which it is easy to make the

diagnosis. Dr. Willey showed me a plate at the University about which there was some doubt. I diagnosed tuberculosis, even though it was impossible to find the bacillus. Some of these pictures are so characteristic that it is impossible to mistake them. Theoretically speaking, a mass of tubercles ought to produce a mottling. Sometimes we get only dense shadows simulating a thickened pleura. Then you must be careful. Williams was able to detect a normal difference between the two apices. He may be able to do so, but I can not. I would caution people, however, to make a diagnosis on the diffuse shadows of the apex. If you want to make a diagnosis of apical tuberculosis you ought to find more than a slight difference in density. You ought to turn your patient around several times. Always interpret your picture in the light of what you find with the fluoroscope. To discard the fluoroscope entirely is one-sided. Do not do it. Although I champion quick exposures in skiagraphy of the chest, I do advocate fluoroscopy as well, and I can see an immense benefit in the use of the diaphragm not only in apical disease of the lung, but in disease of every other part of the body where you want detail. Most of us have not used the diaphragm as much with the fluoroscope as we ought to. You can get a beautiful fluoroscopic view of the apex if you have a good diaphragm; and, then, for the sake of having a record, take a skiagraph and you will do better still.

DR. HICKEY, closing the discussion:—I was very much pleased at the interest shown in the plates. The interpretation of these plates is a matter of the greatest difficulty, and only by profitable discussion will we arrive at anything that is of value to us in our work.

My paper was not written in disparagement of a large plate or of the fluoroscope, but the object was to bring out the use of the diaphragm, which shows increased detail in the parts of the lung that we wish to examine.

In regard to taking plates of the lung inflated and empty, I only made one experiment and that was two years ago, and the data were insufficient to draw any conclusions from. It is difficult for the patient to suspend respiration with the air in the lung minimized It is better to take the picture while the chest is moderately full of air, as the patient is then least likely to move.

RADIOGRAPHIC MEASUREMENT OF THE DIAMETERS OF THE FEMALE PELVIS AND NEW TECHNIQUE IN RADIOGRAPHING VESICAL CALCULI.

By G. E. Pfahler, M. D., Philadelphia, Pa.

Probably the most critical period in the life of a woman is that of the birth of her first child. Two lives are at stake at this time. Much of the uncertainty could be eliminated if the attending physician could determine accurately the diameters of the pelvis of the mother; and if with this he could know the exact size of the child's head, the case could be dealt with in the most skillful manner.

If the diameters were found to be contracted premature labor could be induced, or all provisions could be made to assist in the labor before the woman became exhausted, or a Caesarean section could be performed and in this way the lives of both the mother and the child could be saved.

Obstetricians have done much toward accomplishing this result by taking external measurements of the pelvis, and by measuring approximately the internal diameters. Accuracy has, however not been obtained though very much desired.

It is this long felt want that prompted one of our obstetricians, Dr. W. Frank Haehnlen, to suggest to me the use of the Roentgen Rays for this purpose. Scattered attempts have been made to measure the diameters of the female pelvis by means of the Roentgen Rays, but in general the methods used have not been found practical. Even the method that I shall describe, though it seems very simple, may not be found practical.

On account of the mass of tissue to be penetrated in a pregnant woman it will be found difficult by any method, and it is likely that only those who have perfected their technique and are able to make short exposures will feel justified in attempting this work. Stereoscopic radiographs might be made, but this will necessitate two exposures, and in the light of recent experiments (which I believe to be exaggerated in importance) it is desirable to make a single exposure and that as short as possible.

It was as a result of the suggestion of Prof. Haehnlen that I have developed the following technique and

apparatus for the purpose of measuring the diameters of the female pelvis.

This, as any other technique which has for its end result accuracy, must have accuracy as far as possible in every little detail. Unless each measurement is taken accurately the end result will be inaccurate and will be of more annoyance to the physician than assistance.

The principle upon which this technique is based are as follows:

1. The plate must be placed parallel with the brim of the true pelvis.

2. The distance of this pelvic brim from the anode must be measured as accurately as possible and recorded.

3. The anode of the tube must be placed in the axis of the plane of the brim of the pelvis.

4. The exact distance of the anode from the plate must be accurately measured and recorded.

If these four principals are accurately followed the diameters of the pelvis will be accurately determined. Any error in the observance of these four principals will necessarily give an error in the end result. Therefore our whole attention will be occupied in providing means to observe these four principals:

1. For the purpose of placing the plate parallel with the brim of the pelvis I have constructed a Radiographic Pelvimeter, which consists of a base board 10x24 inches. At a distance of 9 inches from one end is placed a second board 10x11 inches, at an angle of 30 degrees, which is the angle of the plane of the brim of the pelvis with the body. This is supported by a triangular piece of wood. This "Radiographic Pelvimeter" is placed upon any radiographic table. The patient is placed upon the base board with the buttocks and coccyx resting upon the bracket. This bracket will then correspond to the plane of the brim of the average normal pelvis. By means of a mattress, the body is raised about three inches so as to bring the entire shadow of the brim of the pelvis upon the plate. Patients prefer to lie upon a mattress, and since it in no way interferes with the accuracy it is an advantage rather than an objection. The plate is then placed upon this bracket beneath the pelvis. The thighs are flexed upon the abdomen and rotated outward. They may be supported by means of a bandage extending from the hook at the end of the base board.

2. We must now determine the distance of the brim from the plate or from the anode. By palpitation the crest of the pubis can be felt, and the thickness of the

fat estimated as accurately as possible, and subtracted from the total distance of the pubis from the plate. The estimation of the thickness of the fat will give practically the only chance for error in the end result. A man should, however, be able to estimate the amount of fat to within an eighth of an inch.

3. The third step is to place the anode of the tube in the axis of the brim of the pelvis. To facilitate this I have placed a rod at right angles to the board holding the plate, and attached it to the middle of the top edge. The median line of the body should pass through this rod. This rod is now parallel to the axis of the brim of the pelvis. We now measure the distance from this rod to the inside of the pelvic brim, which can be felt at the symphysis pubis. To this distance is added 2 inches (half of the normal antero-posterior diameter). A second movable rod attached at right angles to the first rod will facilitate the making of these measurements. (I am indebted to one of my students, Dr. Gaylord, who is a skillful mechanic, for the construction of these rods.) The anode is easily placed in a line with the point obtained by these measurements and is done in less time than it takes to describe it.

4. The fourth step is to measure the distance of the anode from the plate. This of course is very simple. The anode can be placed at any distance. The greater the distance, the greater will be the accuracy, but the difficulty of getting a good radiograph will also be greater. I have found 20 inches most convenient.

Having recorded these factors and obtained a good radiograph, the determination of the diameters of the pelvis is a mere matter of calculation.

The diameters as measured in the radiograph represent the degree of divergence of the rays at the distance of the plate from the anode (20 inches). The question then is, "What is the degree of divergence of the rays at the distance of the pelvic brim from the anode?" (We obtain the distance of the anode from the symphysis by direct measurement, or subtract the distance of the symphysis from the total distance of the anode from the plate.)

Reducing this to a formula, let "A" represent the total distance of the anode from the plate; "B" the diameter as measured in the radiograph; "C" the distance of the symphisis or pelvic brim from the anode, and "X" the diameter of the true pelvis. Then the formula would stand:

A:B::C:X.

Taking as a concrete example Fig. 3, which is a radiograph of a normal skeleton pelvis. The distance of the anode from the plate was 20 inches; the antero-posterior diameter as measured in the radiograph is 5½ inches; the distance of the anode from the symphysis was 16¾ inches; therefore the antero-posterior diameter of the true pelvis must be 4.29 inches, and this is the correct measurement of the pelvis used.

Taking as a second concrete example Fig. 4, which is the radiograph of a normal pelvis in a living woman (non-pregnant). We have a right to assume that a woman who has given birth to a normal child, normally, has a normal pelvis, the woman being normal in all outward appearances.

The distance of the anode from the plate in this instance was 20 inches; the antero-posterior diameter as measured in the radiograph is 5.5 inches; the distance of the anode from the symphysis pubis was 14.5 inches; therefore the antero-posterior diameter of the true pelvis at the brim is 3.9875 inches. Four inches is given as the normal antero-posterior diameter, therefore this must be considered normal.

This may seem like a complicated method, but it is not, and the only real difficulties will be in obtaining a good radiograph in a pregnant woman, and in determining accurately the distance of the symphysis pubis from the anode of the tube.

We should be careful to place the brim of the pelvis parallel to the plate. This can be done by determining that the anterior superior spines are the same distance from the plate. If the patient is allowed to twist her body, the pelvic shadow will of course be distorted.

This method has the advantages of simplicity and accuracy, with only one exposure.

I began this work only a short time before going away on my vacation. This, with the fact that our maternity wards are practically closed during the summer months, has prevented me from making practical application of the method in pregnant women, and in this way working out some of the practical problems that I feel will present themselves.

New Technique in Radiographing Vesical Calculi.

One of the advantages of the present method of radiographing vesical calculi is that the shadow must be projected a considerable distance before reaching the

plate. This decreases the intensity of the shadow and at times makes it almost or quite impossible to recognize. Another disadvantage is the possibility of having the shadow of the vesical calculi obscured by the shadow of the pubic arch as it is projected forward.

By making use of the "Pelvic Bracket" and the technique described for measuring the diameters of the pelvis (omitting the measurement) we bring the plate nearer to the calculus, and thus increase the intensity of the shadow and the certainty of the diagnosis.

It has not been my privilege to examine a case of vesical calculus since I have adopted this technique. I therefore have no illustration to offer to you. It surely offers some advantages, however, and I see no disadvantages.

I offer whatever apology is due the society for presenting these subjects incompleted, but lack of time and opportunity to date have prevented my completing these investigations. I present these subjects at this time before this body of expert Radiologists because they are purely technical subjects, and for the purpose of receiving criticisms and suggestions that will assist me in further investigations, and with the hope that they may be made use of by others.

DISCUSSION ON DR. PFAHLER'S PAPER.

DR. ALFRED L. GRAY, Richmond, Va.:—This seems to be a very simple and accurate means of measurement, but there is one point that I want to discuss, with reference to the technic for vesical calculi by this method. It has been my custom to have the patient sit on the plate with the body at an angle of about forty-five degrees with the table. This method presents an advantage which Dr. Pfahler's does not. If the patient has a stone in the bladder which is free, it will gravitate to a point nearer the plate in that position than it would in the recumbent position. In Dr. Pfahler's position I do not think that the most dependent portion of the bladder would be the point nearest the plate and the stone would therefore be a little farther away than in the sitting posture.

DISCUSSION OF DR. PFAHLER'S PAPER.

DR. H. W. VAN ALLEN, Springfield, Mass.:—I wonder what the effect of this work will be on the public mind. We know that all sorts of marks on the infant are attributed to fright of mother. Would not the laity attribute marks to the X-ray and also any other evils that might befall the child in later life?

DR. PFAHLER, closing the discussion.:—The suggestion of sitting the patient on the plate is a very good one and a simple one for the study of vesical calculi. It offers at least one objection in stout people, and that is, the tendency not only of the stone to gravitate but of everything else to gravitate as well

and thus obscure the shadows. I do not believe that with an empty bladder the stone will change its position very much whether the patient is in the recumbent or in the sitting posture.

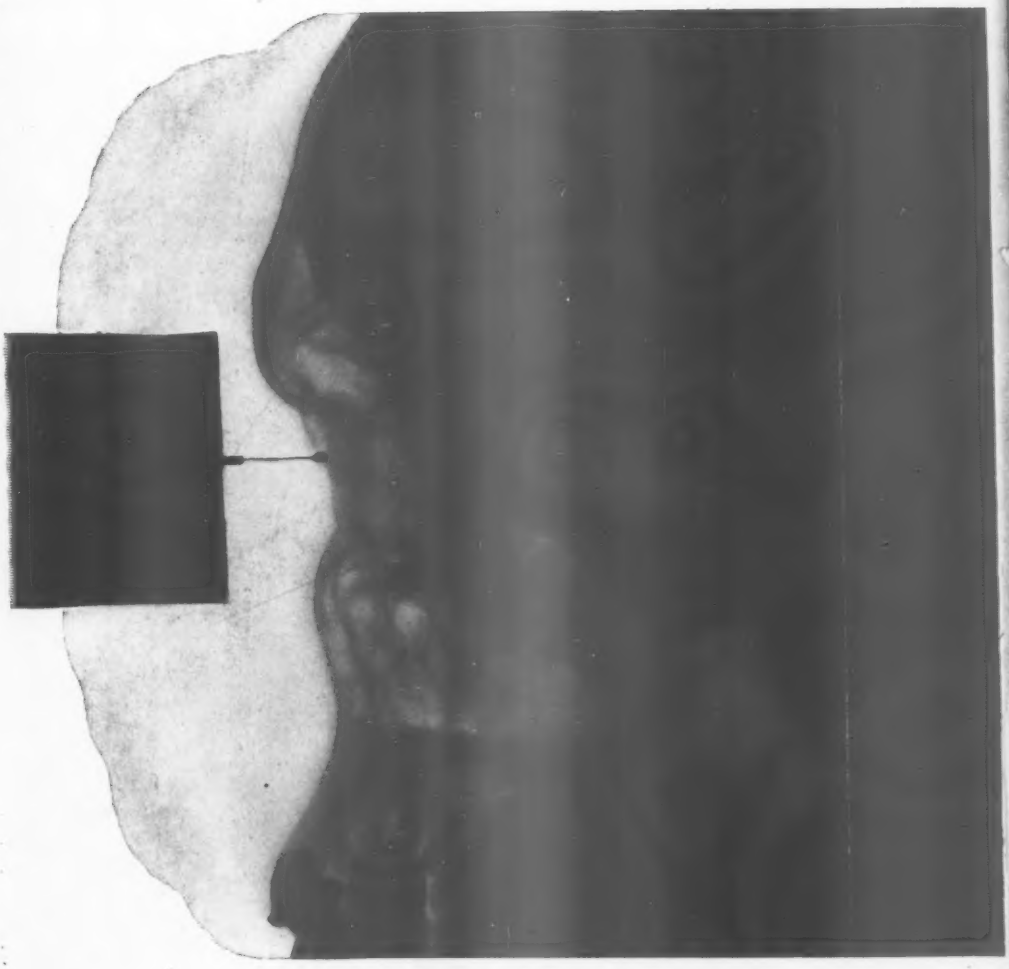
I am very glad that most men feel that these exposures will not be dangerous Of course, all sorts of things will be attributed to this as Dr. Van Allen suggested. This work must be first taken up in hospitals where the patients need not be told of the possible dangers and the ultimate results, since we believe there are no special dangers. They will take it as a matter of course, just as any other pelvic measurements are made. I suppose that years ago, when internal measurements were first made, women attributed marks in the child to that method, but if we really do not get any bad results, the method will recommend itself.

TECHNIQUE FOR THE LOCALIZATION OF FOREIGN BODIES IN THE EYE.

By Charles F. Bowen, Ph. G., M. D., Columbus, O.

The localization of foreign bodies in the eye is perhaps the most important work the radiographer has to do, and as it has fallen to my lot to do much of this work I have developed a technique which has proven very satisfactory and which I will briefly describe.

The apparatus consists in a modification of that first devised by Dr. Sweet of Philadelphia. The same fundamental principles are retained, but the apparatus is changed. Sweet's aparatus, as you know, consists of two balls, these being supported by a plate holder strapped to the side of the head, one pointing to the center of the cornea, the other to the external side of the eye. Two pictures are taken, one with the tube on a level with the two balls, the other with the tube somewhat below the level. The location of the foreign body with reference to the balls in each negative is platted upon a chart and its position is accurately located. This apparatus has not proven satisfactory in my hands for several reasons: First—It is a difficult matter to strap the apparatus firmly enough to the head, without making it uncomfortable for the patient. Second—The patient must sit in a chair or lie on his back, and I find it almost impossible for the patient to hold his head still long enough for a proper exposure. Third—The apparatus cannot be used with the compression cylinder diaphragm. Fourth—In changing plates the position of the apparatus is apt to be disturbed. A device was needed whereby the patient could lie down, the head being firmly held with sand bags, the compression cylinder could be used, and the plates could be changed without disturbing the



Radiogram made by Dr. Bowen's method, showing small piece of steel in the posterior chamber, close to the sclera on the temporal side.

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apparatus. It was to meet these conditions that I made this new apparatus.

The compression cylinder table which I use is the one manufactured by Kelly-Koett. The patient lies upon this table with the side of his head resting upon a plate holder which consists of a small table, 4 inches high and 14x17 inches square. In the top of this small table, upon which the patient's head rests, is an opening 8x10 inches, which is guarded by a piece of celluloid. The plate is placed in this opening from underneath, and is held against the celluloid by a trap door. This plate holder table is large enough to allow plenty of room for sand bags to hold the patient's head absolutely quiet. In placing these sand bags two large ones (not too full of sand) are applied at the back and top of the head, and a third, somewhat smaller, is placed on the side of the head.

The balls of the Sweet apparatus are so arranged that they can be raised and lowered on an upright post which is attached to a lead weight about two inches square and one-half inch thick. After the head is in position with the sand bags, the lead weight with the two balls attached is placed upon the plate holder table and moved toward the eye. One ball is placed against the lid over the center of the cornea, the other points to the outside of the eye. The diaphragm of the compression cylinder is now placed above the head in such a way that the light from the tube is thrown through the head directly over the two balls. When the exposure is completed the plate is changed from underneath the plate holder table. The compression cylinder is now moved about three inches toward the patient's body and tilted so that the light will again pass through the balls of the apparatus. The exposure made, the plates are developed as usual. The location of the foreign body is now platted on the chart after the method of Dr. Sweet's. The charts which are ruled in the millimeter scale, as prepared by Meyrowitz, of New York, are preferable.

For locating pieces of steel I use a tube of rather high penetrative power, one which will read about 6 on Walter's International Penotrometer. For locating glass I use a tube of lower penetration, about 4 on Walter's scale. I pass through these tubes for one minute about all the current which can be generated from a 20-inch Scheidel coil. While the tube is in operation I have an electric fan turned upon it, which seems to cool the tube somewhat.

I have examined thirty cases for suspected foreign

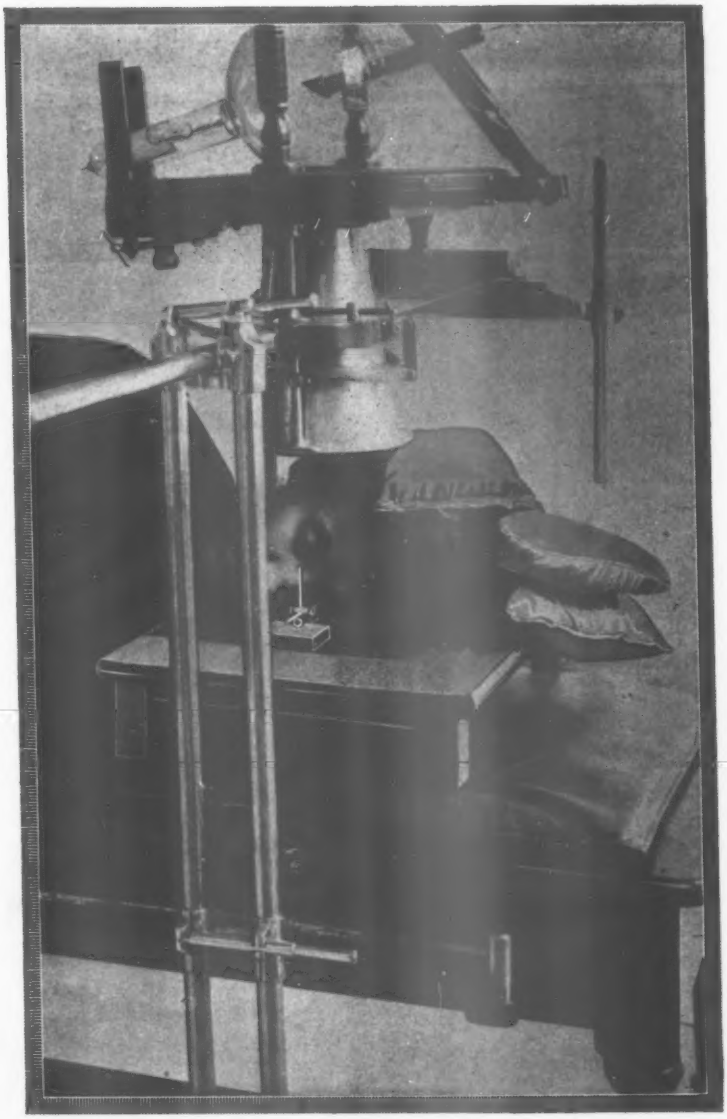
bodies in the eye by this method. In twenty of these cases the foreign body was located, while in the remaining cases no foreign body was present, the pieces having struck the eye and glanced off. A further classification is rather interesting. In seven cases examined for glass I found the body in three. In the other cases it is possible that I overlooked a small fragment, but this is unlikely, since they all recovered with useful eyes and without surgical intervention. Of patients examined for steel, I found the piece in thirteen cases, while in six no foreign body was present. In four cases I found bird shot; in one of these I located fifteen shot in and about the eyes.

In order to illustrate the accuracy of this method I will report a few cases in detail:

Case 1. A piece of steel passed through the sclera, iris and lens, on the temporal side, and was lost in the posterior chamber. Two exposures were made as usual in different directions and the foreign body located on the temporal side, just inside the sclera about half way back, and a little below the horizontal line. The foreign body being so close to the sclera, I decided to take another set of pictures to check the first result. At this examination I located the foreign body about two millimeters from where the first examination showed it, which would bring it just outside the sclera. This was puzzling, and another trial was made. Three consecutive examinations located the foreign body in the sclera, and I then reported to the surgeon the exact location. Under ether an incision was made in the sclera over the exact point where the foreign body was supposed to be imbedded, and the surgeon's knife struck it at once.

Case 2. A railroad engineer, injured by the bursting of a water gauge on his engine, presented a rather large wound of the cornea and iris. Two pictures were taken in the usual manner, but no foreign body could be located. The question was, would the glass cast a shadow? In order to determine this I broke two small pieces of glass from a water gauge similar to the one which bursted, and strapped them to the side of the eye with adhesive plaster. Two pictures were then taken and the small pieces of glass showed plainly. I therefore came to the conclusion that the man's eye did not contain any glass.

Case 3. A man, injured by the explosion of a beer bottle, presented a wound about a half inch long of the cornea and sclera. X-ray examination showed the field



Dr. Bowen's modification of the Sweet method, showing the small table for changing the plates, sand bags, compression diaphragm and lead weight, with small balls for localization.

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in the region of the eye to be free from any abnormal shadows. I then proceeded as in the above case to check my results. The small pieces of beer bottle strapped to the side of the eye showed plainly. The subsequent history of this case, and also of Case 2, shows the correctness of my conclusion.

In all cases of suspected glass in the eye where the X-ray examination gives a negative result, I invariably check my technique by placing small fragments of the same kind of glass to the side of the eye and making a second exposure. If these test pieces of glass show, and my first set of pictures show nothing, I then state there is no foreign body present. In one case I located a thin piece of glass from an electric light bulb; in another a piece from a broken lens in eye glasses, and in a third a piece of beer bottle.

DISCUSSION ON DR. BOWEN'S PAPER.

DR. GEORGE E. PFAHLER, Philadelphia:—I appreciate fully the matter which Dr. Bowen has brought before the society. I have been using the Sweet apparatus, and I think that everybody who has been using it will recognize the advance he made when he presented his apparatus, but we have here in Dr. Bowen's apparatus a very simple device and a decided improvement on Dr. Sweet's apparatus. „

DISCUSSION ON DR. BOWEN'S PAPER.

DR. PRESTON M. HICKEY, Detroit, Mich.: I was very much interested in this presentation by Dr. Bowen because I have felt the inadequacy of Sweet's apparatus for abolishing the movements of the head. I, too, did some work along this line, but somewhat differently. With Sweet's apparatus the patient sits up with his head strapped in the apparatus. He is subjected to involuntary movement of the head, as caused by respiration, and the head is also moved by the cardiac impulse. So I contrived a frame about 14x17 inches, with three adjustable pads. One is put at the forehead, one at the back of the head, and one under the chin. In addition to these three pads, there is the pressure of the cylinder of the diaphragm, absolutely cutting off all movement. I use a 5x8 plate, instead of two 8x10 plates, making an exposure on each half of the plate. The separate plates are apt to be separated after a time, whereas if you have the two exposures on one plate, this is obviated. The half that has been exposed is covered by lead or some other metal, when the other half is brought into the field and exposed. During the exposure it is necessary to have the patient look at a fixed point.

I always place a bright object some little distance from the patient and instruct him all the time during the exposure to keep the eye fixed on that point.

DISCUSSION ON DR. BOWEN'S PAPER.

DR. MIHRIAN K. KASSABIAN, Philadelphia:—I have used Dr. Sweet's apparatus, but recently I constructed a box, inside of which the patient places his head. One semi-lunar pad is placed in contact with the occiput, one over the forehead and one on top of the head. The patient lies on the table and under the box I made an apparatus as for stereoscopic work, so that I make two pictures while the head is entirely fixed and the patient cannot move his head in any direction. In order to fix the patient's eye, I put a mirror inside of the box, so that the patient can look at himself, which he never fails to do.

I think that Dr. Bowen's arrangement is a very good one for making stereoscopic pictures.

DISCUSSION ON DR. BOWEN'S PAPER.

DR. GEORGE C. JOHNSTON, Pittsburg, Pa.:—In doing this work I have encountered the difficulties that have been mentioned, keeping the head fixed and the eye fixed on a certain point. I have a very handy thing about the office. Get a strip of very heavy canvas, about one-half yard wide and two yards long, and sew it up so as to make a bag. At each end of this bag put ten pounds of shot. For making pictures of the hands or anything else, lay the part to be exposed on the table and place this canvas bag over it, the bag of shot hanging down on either side. Then it is impossible to move the part.

DR. BOWEN, closing the discussion:—I always place the center ball of the apparatus against the eyelid so that the eye must be kept closed. The apparatus has proven perfectly satisfactory in my work.

FURTHER EXPERIMENTAL RESEARCH CONCERNING DIRECT, INDIRECT AND SECONDARY RAYS.

Lewis Gregory Cole, M. D., New York.

In the May, 1905, issue of the Archives of the Roentgen Ray was published an article on "Experimental Research Concerning Direct Indirect and Secondary Skiagraphic Rays." An understanding of that paper is essential and, as the paper was never read before a society, and was published in an English paper, I feel that I must incorporate some of it in this paper.

It was in my early experience with the low vacuum method that I secured on several occasions results of so startling a nature that it led me to investigate more closely the conditions which produced them, in the course of which I obtained unmistakable evidence that better work could be accomplished with an old than a new tube, and that an old, either high or low vacuum tube, would, under other favorable conditions to be dealt

with later on, give off a certain ray or class of rays unobtainable from a new tube under any conditions, and in which were combined the best characteristics of both the high and low vacuum methods, giving perfectly clear outline and marked detail in all parts with short exposure. This I called the "Ray of Selective Absorption."

The Roentgen Ray, considered in the form in which it leaves the tube, has, in its application to skiagraphy, generally been regarded as homogeneous in its character. To so regard it is, I believe, a serious misconception of its true nature which is in a degree responsible for not only many of the unsatisfactory results obtained, but for the inability on the part of the skiagrapher to account for many of those oft-recurring phenomena which are so mystifying.

In the article written in May, 1905, I said I shall assume, whether rightly or wrongly, that the rays in their primary form have their inception at the focal point of the anode, where they may or may not be practically identical in their nature and from whence they radiate in direct lines to the walls of the tube throughout its anterior hemisphere.

Roentgen recognized the fact that the X-rays as a whole were capable of setting up secondary rays in substances with which they come in contact outside of the walls of the tube, a characteristic which has been more fully investigated by Prof. J. J. Thomas to the extent of having determined that the degree of this action is in direct proportion to the density of the object in which it takes place.

But, as far as I have been able to discover, no effort has been made to demonstrate the occurrence of this, or similar process in the walls of the tube itself, although I am aware that Roentgen's original conception of the X-ray was that they were of a secondary nature and produced by the cathode streams in contact with the glass not having a metallic target to be focussed on. I am convinced that there are two forms of rays eminating from the tube, their chief distinguishing features being, so far as they affect skiagraphy:

1. The source of origin. (a) The direct ray from the focal point of the anode. (b) The indirect ray from the wall of the anterior hemisphere of the tube.

2. The direction of the line of flight—this is the case of the direct rays being a continuation of their original line of projection from the focal point of the anode; and

in the case of the indirect rays, being at various angles therefrom.

My belief in this led me to the study of the life history of a number of tubes. In the new tube we have perfectly clear glass of ordinary brittleness and smooth inner surface. Upon its first excitement the anterior hemisphere lights up with a bright, yellowish-green fluorescense; this color gradually changes as the seasoning process advances into a purplish-yellow of less brilliancy. This light Dr. Stover, of Denver, Col., calls the "sunflower" light, because of its rich, mellow color. Eventually, in a very old tube there is scarcely any fluorescense whatever, and Roentgen spoke of this as a dead tube.

After a new tube has been used a few times, the glass begins to assume a purple color in its anterior hemisphere. This increases with the use of the tube, and there is a smoky appearance of the glass of the posterior hemisphere. This purple color of the anterior hemisphere has been regarded by some as a result of the platinum deposit on the inner surface of the tube. I do not believe this to be the case, and further on shall give my reasons for this disbelief.

In the new tube a heavy discharge of current will heat the anode red hot; while the same discharge in an old tube will have no effect. In a fluoroscopic examination with a new tube, it is necessary to place the object near the screen in order to get a clear outline of the bones, but as the tube becomes seasoned this distance may be increased until in an old tube the object may be held at some distance and the bones will still appear with clear, well-defined edges, and the medulary cavity showing.

In the new tube there is not a brilliant fluorescence of the exposed parts of the screen, but a diffusion of light over its entire surface and a corresponding lack of contrast between the various degrees of density of the interposed object.

The Crisis of the Tube.—After a tube has been in daily use for three or four months to the extent of six or eight skiagraphs, and possibly a treatment or two each day, it will be found on some particular day that the vacuum is very high, and refuses to gradually respond to the usual methods employed; but after repeated applications in lowering it, it seems to drop suddenly from a high to a low vacuum and there will be purple rays between the cathode and anode. It recovers, how-

ever, from being lowered, and, if treated moderately for a few days, will pass through this stage and be a most useful tube for six or eight months, or even a year or two.

During the crisis the tube acts most peculiarly. If the face of the anode is turned to the side in one direction, preferably north, or parallel to the magnetic current, you will get a very effective ray from the tube with a 2 or 3-inch spark; then if turned toward the earth, it will back up a 12-inch spark without giving off any rays; and by simply returning the tube to its former position, it will again give an effective ray on a 2-inch spark. This I have demonstrated to the hospital staff. It only occurs on one or two days in the life history of each tube, and usually after the tube has been used for three or four months. This fact I have noticed in every tube which has been used for that length of time. This is what I consider the crisis of the tube. An explanation of these phenomena I cannot give; but that they do occur I am absolutely certain, and that the tube is more effective after passing through this stage, I am equally sure. Carrying the tube up to and through this critical period may be termed as seasoning it.

The vacuum may be raised in a low tube by making and breaking the current repeatedly, preferably by approximating and withdrawing the secondary terminals. This I know will raise the vacuum of the tube, but its modus operandi I cannot explain. If, each time a new tube is used, it be allowed to rest for a day or so, it will bear a greater amount of current without the vacuum being impaired, and eventually, instead of the vacuum dropping it raises, and the character of the ray improves steadily. Up to this point the power of penetration of the soft parts, and the amount of spark it backs up, seem to be in proportion to the height of the vacuum of the tube.

Changes in the Gas in the Tube—During and presumably as a part of this seasoning process, the gas remaining in the tube seems to undergo some change productive of a higher vacuum. When a tube, which has undergone this process, is re-exhausted, it will act as a new tube, as regards the falling of the vacuum during the period of excitement. If, however, the tube is not re-exhausted, this change continues to increase with the use of the tube until a 12-inch spark, or even a greater, is necessary to effect an excitement; which even then will continue only a few seconds, unless the vacuum be repeatedly lowered by heating the palladium point; but

with even this high vacuum, as before stated, the bones during the intervals of excitement of the tube appear very black in the fluoroscopic examination with an accompanying greater penetration of the soft parts, a combination to which I then applied the term "The Ray of Selective Absorption."

The difficulty encountered in exciting a tube which has reached this condition, owing to the discharge of the current around the surface of the tube, is generally attributed to the presence of the above-mentioned platinum deposit on the inner surface of the tube, acting as a conductor of the current between the poles. While this deposit may exist, I doubt if it so affects the discharge, for the reason that the tube, if re-exhausted without undergoing any known process calculated to remove such deposit, may be excited by a moderate energy, the vacuum dropping as in a new tube, and without the immediate recurrence of the phenomenon.

A seasoned tube produces a brilliant fluorescence of the screen on its exposed parts, this being much diminished where the soft parts are interposed and an almost entire absence of light where the bones interpose, with marked detail throughout the skiagraph.

If a new tube backs up 6 or 7-inch spark the bones are nearly obliterated and the edges are blurred and indistinct, while an old tube may back up a 12-inch spark without increasing the penetration of the bones enough to perceptibly dim their shadow, and in an old tube even the small bones of the hand will apoear distinctly black. regardless of the length of spark which it backs up, and the soft parts will each absorb a certain amount of light.

In the meantime, the glass of the tube has become brittle and rough on its inner surface in the anterior hemisphere upon which the radiations from the anode have acted directly, while the glass of the posterior hemisphere is not perceptibly changed from its original texture.

As to the cause of the discoloration of the glass of the tube, I am of the opinion that if this is due to the presence of any metallic substance in any form, it is of aluminum rather than of platinum, for the reason that in the anterior hemisphere, the part of the tube immediately adjacent to the aluminum parts are more highly colored than others, while the portion of the lower half of that hemisphere, which is shielded from the direct rays from the platinum secondary cathode by the intercepting anode, has less discoloration. The different col-

Photograph of specially constructed tube in action. A thin piece of aluminum and a fragment of glass from a broken tube are suspended in front of the anode, midway between it and the wall of the tube. X-Rays pass freely through both of these substances.

The deflected cathode stream is obstructed by the aluminum and glass. Anterior hemisphere of the tube shielded from the focal point of the anode does not fluoresce and does not generate indirect rays. Therefore the fluorescence of the tube and the indirect rays are caused by deflected cathode stream.

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orings of the two hemispheres, the purple of the anterior and the brown of the posterior, might be attributed to the different manner in which the metallic particles are deposited upo n or throughout the glass. The glass of the posterior hemisphere being unexposed to the direct discharge from the anode, undergoes less molecular disturbance, and the metallic particles are simply deposited on the inner surface of the tube, while the direct discharge from the anode upon the walls of the anterior hemisphere sets up an intense molecular action in the glass which permits of the metallic particles being carried into and even through the glass. That some of them are carried through the glass, is indicated by the fact that this same purple discoloration takes place in pieces of glass which have been exposed for some time to the direct action of the rays outside of the walls of the tube.

That the molecular action above referred to results in a molecular rearrangement in the glass of the anterior hemisphere is a further proposition, which, while beyond absolute proof by any means at my command, is so strongly suggested as to at least be worthy of most careful consideration. This rearrangement, it seems to me, is somewhat similar to that occurring in steel which has been magnetized. Whether this consists of simply an alignment of the axis of the molecules in parallel with the normal direction of the discharge from the anode, this taking place slowly and progressively with the use of the tube, or whether it consists of some more complex action, that tends to a continuance of the original lines of force of that discharge, is a problem, the solution of which is outside my domain.

The lower the fusible point of the glass, the more susceptible it is to the action which results in the discoloration.

The fluorescence in the tube composed of glass of a high melting point is of a brighter and more greenish hue than that occurring in glass of a low melting point, while glass of an exceedingly low melting point fluoresces blue. The variety of results thus obtained being apapparently due either to difference in the chemical composition, or the molecular construction of the different glasses composing the respective tubes, or both.

The glass of the anterior hemisphere of the tube, exposed as it is to the action of the direct discharge from the anode, becomes, as already stated, more brittle than the glass of the posterior hemisphere. In the case of a seasoned tube becoming punctured in its anterior hemis-

phere the part of the glass immediately surrounding the puncture, after being subject to a degree of heat necessary to the process of repair, is apparently restored to the condition of the glass in a new tube, and resumes all the characteristics thereof; the color disappears, it fluoresces a bright greenish-yellow, and probably is less brittle.

All these facts, it seems to me, tend to verify the theory that some change takes place in the molecular formation of the glass which, as it progresses, permits the free passage of a continually increasing volume of the direct rays or the inability of the glass to generate indirect rays. When this change becomes practically completed, as in a seasoned tube, we are able, all other conditions being equal, to secure a very large proportion of direct rays.

Hitherto a skiagraph lacking in contrast, but with marked density in all parts, has been considered as due to a high degree of penetration. Considering, however, the nature of these indirect rays, and the fact of their ability to set up secondary rays in all objects with which they come in contact in the surrounding atmosphere, and especially in the soft parts of the tissue which they encounter, it can be readily understood that they thus reach the plate from all directions, projecting themselves at various angles beneath the subject behind the bones or other substances, causing thereby an entire lack of definition of all parts and an obliteration of detail in the soft parts We are thus forced into a recognition of their baneful efforts, and of the fact that to them, rather than to the degree of penetration, is due the imperfections above noted.

On the other hand, the direct rays, reaching the plate as they do in established lines from a fixed or ascertainable point, and being absorbed by the tissues interposed, presumably in proportion to the amount of solids contained therein, give a clear outline and perfect detail, even of the softer tissues and with a preponderance of these rays we are able to show not only the bones and muscles, but the kidney, and spleen, and walls of the intestines, and the arteries, and in one case which I have recently made, even the blood with the veins, showing the anastimosis around the knee and elbow.

The indirect rays are caused by the deflected cathode stream that has not been converted into X-rays at the focal point of the anticathode, but are carried along with the direct rays until they strike the wall of the tube and

are there converted into what I termed indirect rays.

First. As originally illustrated by Roentgen the cathode stream caused a brilliant yellow fluorescence of the glass when focussed directly on it.

Second. Prof. J. J. Thomson describes an experiment in which he shows that all cathode stream is not converted into X-ray at the focal point, but that some of it is deflected.

Third. The cathode stream causes great heat when focussed on glass That part of the tube behind the target is not heated to the same degree and does not fluoresce like that part exposed to direct X-rays and the deflected cathode stream.

Fourth. The similarity of the point T in Fig. 3, where the cathode rays strike the wall of the tube. and the disc F were the things that led me to this line of investigation. The X-ray either direct or indirect does not generate any heat in passing through the glass. Therefore, the heat of the glass tube is not caused by the X-ray generated at the focal point of the anode, and is not caused by the heat radiated from the anode, because the posterior hemisphere is colder than the anterior.

Fifth. In a tube so constructed that a piece of thin aluminum, mica or glass shields some part of the anterior hemisphere from the focal point of the anode, that part of the glass so shielded does not become hot, does not fluoresce, and does not give off indirect rays. Heat is only generated where the cathode stream, either direct or deflected, is converted into X-ray.

In a low vacuum tube more of the cathode stream is converted into X-ray at the focal point of the anode than in a high vacuum tube, and in a very high tube the cathode stream deflected from the anode is not converted into X-ray at the wall of the tube, but is again reflected to some other part of the tube.

Glass exposed to the direct rays and the cathode stream direct. or the deflected. undergoes the molecular activity and change described in this paper, and does not generate the amount of indirect rays that new glass does. The thinner the glass the less indirect rays generated. A coil and interrupter so constructed as to generate a current of very high voltage with low amperage will cause more of the cathode stream to be deflected than one with lower voltage and lighter amperage. The tuning of the apparatus is, I believe, the regulation of it so that the greatest amount of the cathode stream is driven at the same velocity.

A tube so constructed as to cut off all the deflected cathode stream is the first thing to think of. But the ideal is a coil and interrupter and tube so constructed that the entire cathode stream will be converted into X-ray at the focal point of the anode.

The direct rays are generated at the focal point of the anode by the impact of the cathode stream, from which point they pass in all directions in front of the anode and are absorbed by the tissues interposed presumably in proportion to the amount of physiological solids they contain, giving clear-cut, well-defined shadows even of the very soft tissues. Some secondary rays are generated by the direct rays.

The indirect rays are generated at the wall of the tube by the deflected cathode stream which has not been converted into X-ray at the focal point of the anode but are carried along with the direct X-rays to the wall of the entire anterior hemisphere, where they are converted into indirect rays. These indirect rays pass in all directions from the wall of the tube, behind the target as well as in front, and owing to the large area of the source of origin and the secondary rays generated in the soft parts they cause a blurring of the outlines of the bones and soft parts. The secondary rays are caused as much or more by the indirect rays than they are by the direct rays.

A tube so constructed that none of the deflected cathode stream can strike the walls of the tube will not fluoresce and will not generate indirect rays. But the ideal is to have a tube, interrupter and coil so constructed that the entire cathode stream will be converted into X-ray at the focal point and that X-ray will be purely direct ray.

DISCUSSION OF DR. COLE'S PAPER.

DR. DUNHAM, Cincinnati:—The fact that there are several varieties of rays with which we must deal in taking a picture is true, and this fact has been beautifully demonstrated by Dr. Cole's experiments, but if the doctor intends to say that these facts are new and original I differ with him.

We have X-rays coming direct from the target, due to the impact of the cathode stream on the anode—the direct rays.

Second, we have the rays from the surface of the tube due to the impact of either the stray cathode particles, as I understand Dr. Cole to believe, or due to the X-rays passing through the glass wall. The rays which start in all directions from the tube surface have had many names given to them, one of which is the glass rays.

Third, we have the rays which are produced entirely outside of the tube by the X-rays striking some form of matter, even being

produced as Roentgen proved by striking the air. These Dr. Cole termed the secondary rays.

Every one of these facts are clearly and scientifically dealt with in Roentgen's third paper. In this paper there can be no doubt of his meaning, for here he was dealing with a focus tube.

The only new fact which Dr. Cole has affirmed is that the glass rays are produced by stray cathode rays striking the glass and not by the X-rays striking the glass.

The construction of the compression diaphragm was based upon the necessity of eliminating these foreign rays and their existence was beautifully illustrated by diagram. Many besides Albers-Schoenberg have written on this subject.

It may be that I have misunderstood the doctor's attitude, and he will explain in what way his conclusion differs from those of others previously expressed.

DISCUSSION ON DR. COLE'S PAPER.

DR. WELLS, St. Louis.:—I wish to support the essayist. No man can work over things in his own way without adding to the sum total of knowledge. Dr. Cole certainly has done original things and so far as I am concerned his subject is more appreciable to me now than before hearing him.

I want to mention in connection with the secondary ray a phenomenon that has disturbed me long, one that I have noticed for several years and have been unable to explain. I refer to the mottling spotting of the plate which is sometimes observed after development. I have just spoken to one member about it and he regards it as an imperfection of the plate. I believe that that is the concensus of opinion among X-ray workers. This mottling or spotting occurs usually in the part of the plate that is uncovered and merges over into the part that is covered by the object being radiographed.

It occurred to me just recently that it was due to something peculiar to the X-ray, for the reason that I had never seen it in a plate which had been developed after exposure to ordinary light, nor in one that had been over-exposed to ordinary light. I accordingly made an experimental exposure of an 8x10 plate in four sections. The first quarter of the plate I gave what I thought to be a normal exposure to get a maximum degree of reduction in development. To the second quarter I gave what I thought would be a partial over-exposure; to the third a little more, and to the fourth I gave a long over-exposure. My results coincided with what I expected. In the first quarter I got a typical complete reduction; in the second a great deal of the mottling; in the third the condition was more of a uniform haze, and in the fourth a complete solarization, or over-exposure, of the film took place. That, to my mind, is complete proof that the mottling is due to varying degrees of over-exposure of the sensitive film.

The explanation of the phenomenon is, I believe, that the shaft of light is complex, consisting of the direct and indirect ray, the former having greater actinic activity than the latter. This gives the varying degrees of reduction on the plate.

Until I find some more tenable explanation, I shall accept this theory, and I believe that the experiment I made is fairly conclusive and can be repeated by any worker. By bromide restraint I believe you can prevent its occurrence. I am quite sure

you have all seen this phenomenon. It has occurred so often in my work that I am sure it is not a thing peculiar to my technique.

DISCUSSION ON DR. COLE'S PAPER.

DR. SINCLAIR TOUSEY, New York City:—I have made quite a number of experiments with the X-ray that have led me along a different path. With reference to the invention of an apparatus which I might call a registering ortho-diagraph: I use an ordinary ortho-diagraph, but have the tube completely enveloped in an opaque substance. Instead of making the mark with a pencil, tracing the outline of the heart as I see it on the screen, I move the apparatus back and forth and produce a picture on a photographic plate which is backed up by lead, and the only ray which is allowed to reach the plate is a straight parallel line of X-rays which pass through the body. The effect is the same as when we take a quarter of a dollar, wrap it up in paper and then with the end of a lead pencil we press on the paper, rubbing the pencil back and forth. This makes marks on the paper which show the projections of the coin and gives you a good representation of it. We have covering the necessary area an infinite number of very small pictures that overlap, and thus we get an actual image of the heart on the plate.

DR. COLE, closing the discussion:—Regarding what Dr. Dunham said, I wish to say that I have read Roentgen's work very carefully but I fail to find any mention made of this. He spoke of the direct ray, of the cathode stream causing the fluorescence of the glass when it was focussed directly on the glass but he does not speak of the cathode stream being deflected from the focal point of the anode, and causing the fluorescence of the anterior hemisphere.

The diagrams I have seen all show energy generated at the focal point, and that for some reason the rays which emulate at right angles to the face of the plane of the anode or near that were spoken of as direct rays, and those which come off at a greater angle were spoken of as a more or less indirect ray.

I may be mistaken about that or there may be some diagrams that I have not seen, but no one who has seen these diagrams that I showed you, with the rays generated at the wall of the glass has told me that that has been shown before. And no one has shown me that these rays were caused by a deflected cathode stream. There may be something in the German literature that I have missed, but some of those who have seen my paper before surely would have known of this.

As how it is possible to produce the greatest amount of direct rays in an article published in the Archives of Roentgen Rays, May 1905, I mentioned:- First, the use of old tubes. For some reason the glass in old tubes becomes dead, as Roentgen called it, and they do not fluoresce as brightly as new tubes and therefore do not produce as many indirect rays, while as many or more direct rays are produced at the focal point of the anode. If you heat the glass it will assume its original texture and produce as many indirect rays as new glass. Therefore use old tubes.

Second, a unison between a tube, coil and interrupter described in the same article produces less indirect rays.

Third, a screen of glass, aluminum or some substance near the anode to prevent the deflected cathode stream striking the glass and producing indirect rays, may prove successful.

Fourth, the use of the compression blend or diaphragm to etu off the indirect ray, is also practical. But the ideal thing is to produce a coil, tube and interrupter so that the entire cathode stream will be converted into X-Rays at the focal point of the anode.

ROENTGEN RAYS IN THE TREATMENT OF LUPUS VULGARIS.

H. W. Van Allen, M. D., Springfield, Mass.

In presenting this important subject to you I shall endeavor to be as concise as possible, speaking from the standpoint of the radiologist rather than that of the dermatologist.

I will strive to demonstrate two distinct methods of treatment, each applicable to a certain condition of the disease and not to another.

The inability to effect a cure when the one method, which for certain forms of the disease would be correct, is used upon another form is, I believe, the cause of some reported failure.

Freund reported cases treated in 1897 with success, and in 1900 P. M. Jones, of California, reported very fully his work along this line.

Thus we see the length of time the X-ray has been used in this disease is considerable, and it should have been placed upon an established technique. The diagnosis in my cases rested upon microscopical findings in more than half the cases, and in the remainder upon the opinion of capable dermatologists.

These cases usually run over such a long period, and have seen so many physicians, that they present themselves with a ready made diagnosis, which only needs to be confirmed.

Another class of cases showing both signs of Lupus and Epithelioma can be diagnosticated by the reaction under the X-ray.

Let us first turn to the Pathology of Lupus, and I hope to demonstrate from this as a basis the rationale of the appended treatment.

Hyde and Montgomery state that the "essential lesion in all forms of cutaneous tuberculosis is the nodule of granulation tissue containing small round cells, larger epitheloid cells, and giant cells, having a homogeneous center, and few or many large vesicular nuclei situated for the most part along the border of the cell. Around and between these cellular elements is woven a network

of connective tissue bundles." And here follows a significant fact: although there is marked proliferation of the endothelium of the vessels, no new vessels are formed, the old ones becoming obliterated, and there results a necrosis or cheesy degeneration of both cells and intercellular substance. Tubercle-bacilli are less numerous in Lupus Vulgaris than in any other tubercular skin lesion, but are always present in the nodule and are predisposed to the giant cell.

The above-named authors further state this important fact, that in Lupus, more than in any other form of cutaneous tuberculosis, the proliferation of cells leads to a constructive or regenerative process, as a result of which the lupus nodule may be replaced by scar tissue, or there may be an excessive formation of new connective tissues producing the various degrees of elephantiasis so often seen in Lupus.

Involution of the lupus tissue is accomplished by (1) reabsorption of the tissue, (2) by fibrous metamorphosis, (3) and by ulceration. When fibrous metamorphosis takes place a mass of connective scar tissue takes the place formerly occupied by the lupus growth.

I have had a number of microscopical examinations made of lupoid tissue after the diseased area had been subjected to X-ray treatment for some time and the findings seemed to agree very closely with those of Heuter, who, as far back as 1900, stated that the primitive lupus tissue underwent a transformation into fibrous tissue, only a few groups of tubercular cells remaining. The giant cells were very numerous and were most marked at the margin of the nodule, where they were seen in great masses, almost or quite displacing the leucocytes which normally surround the tubercular focus. This arrangement of cell elements allows the greatly increased connective tissue to immediately and closely surround the nodule. It makes a well-defined limit to the tubercle. No tubercle-bacilli could be found in any case after an extended course of treatment. Dr. Grouven, who has made valuable research in the field, says about the same thing. He is struck by the abundant connective tissue which encapsulates the several tubercular foci in the form of thick bundles of fiber penetrating more or less freely the interior of the foci themselves. Thus the remainder of the nucleus is enveloped by a closely woven network of connective tissue. The spindle cells, which are present in great numbers, also suggest the active proliferation of connective tissue.

I cannot refrain from quoting a little from the report of Doutrelepont, in which he says of a section from a case ofter ten weeks' treatment, "that the tubercle is seen to be surrounded by a mass of leucocytes, and is replaced almost entirely by connective tissue containing a few lupoid cells, with an occasional giant cell." He claims that the cure by the use of the X-ray seems to be as follows: The hyperaemia set up by the X-rays provokes an abundant migration of leucocytes from the vessels. This action takes place first at the edge of the tubercular nodule and penetrates by little projections into the substance of the nodule, being in time changed into fusiform cells and fibrous connective tissue. The presence of these fusiform cells bears witness to the active formation of the connective tissue.

These few remarks on the fine anatomy of the parts, both when nature is attempting a repair alone, or when the X-ray has been used, give us a clue to a rational treatment, which I hope will meet with the Society's approval.

Cases presenting themselves for treatment readily divide themselves into two classes in regard to size—the small pea-sized lesion with a single nodule and a surrounding zone of infiltration, and the more extensive disease with numerous nodules and more or less unhealthy intervening skin.

We will speak of the latter first—remembering that nature's first effort in repair, as demonstrated above in these cases, unaided, is to produce connective tissue and, as it were, crowd out the unhealthy deposit, she first sends from the blood vessels in the parts a large number of leucocytes. We can cause just this to occur with the X-ray—a mild degree of radiation with a medium tube causes fatty degeneration in the blood vessels near the surface, and the leucocytes pour forth into the tissues and later fibrous connective tissue takes its place. This step being accomplished, we must wait until the skin recovers nearly a normal appearance Now we have nodules alone to care for, the skin being simple, non-infected scar tissue. Again, turning to nature, what does she do with these tubercular foci? Causes them to slough out. Just so with the X-ray.

Protecting the new made connective tissue the ray is applied only to the nodules—here, as in the first class of cases where there is a single small infection, this ray must be applied in large and repeated doses, with a low action tube, until necrosis will follow, but not until it

actually occurs. All this being accomplished, we have a healthy scar surface, and small non-tubercular simple ulcers. which heal rather slowly, but seem to be, when healed, permanent.

This is the plan which may be varied in the details at the will of the operator but with very pleasing success I have found.

I will take a little more of your ime to give the details of my technique: As a generator I use a 12 glass plate static, 32 inches, run at about 400 revolutions per minute. This gives a high voltage, low amperage current of good volume. Tube, the ordinary American made. German type, with a heavy platinum anode. I believe other metals or platinum plated targets are not as effective.

For the treatment of the general surface the tube backs up an air spark gap of from one to two inches, distance from the anode to the skin about ten inches, and the treatment ten minutes in duration. Application being made twice per week until the first idea of hyperaemia can be obtained—this averages about a month or less. then the treatments are given once a week for about a month longer. After this the patient is told to come back in a month, when usually the surface is of a pinkish, healthy color, and nodules can be clearly made out. At times several have been brought to the surface which were not visible before. Now protecting the intervening tissue the nodules are alone treated with a tube having less than an inch, and less than a half-inch is better, air spark gap. Anode six inches from surface, the treatment being twelve minutes long, and made three times per week. until a very decided reaction takes place, which, when the cumulative effect of the treatment occurs, produces scabbing and slight ulceration. As soon as the active cauteral action commences to subside I have found the high frequency discharge, given off from a low vacuum tube, excited by a Tesla coil and resonator attached to the static machine. to be of great value in hastening the repair of the cicatrication.

A word as to the protection of the patient: I have tried various methods but none seem as good as thin sheet lead, about like thick tea lead. This I have backed up with cloth stitched around the edge, to prevent from brush discharge, and holes are cut through—first, for the whole surface, and bound with adhesive plaster, making a permanent shield, which will last and remain perfect all through the treatment; for the second part of

the treatment, a smaller sheet of lead is taken and individual holes are cut for each nodule. This shield is held exactly in position by two or three narrow strips of adhesive plaster, which project over the edge and adhere to the skin; over this is laid the first or large shield, to protect the surrounding parts.

The patient I usually have in the recumbent position, as in this way they are the most comfortable and less apt to move, which changes the target distance. It also allows the shield to be without any support, as in the case of the face a band around the head.

A word in regard to the usefulness of the X-ray treatment in comparison with the two other methods practiced. The surgical method, either by the knife or curette, is painful and leaves frequent scars. The percentage of returns is large, as the infection often extends much farther than is apparent at the time of operation.

However, worse than this is the danger of infection to the adjacent, or even more distant parts from the open blood vessels and lymphatics.

The other method, that of Finsen, is a competent rival of the X-ray treatment, but it has some very serious objections. The treatment extends over a long period, sometimes years, at frequent intervals, now and then as often as twice daily—each sitting being, at times, an hour in length—so that the total time under actual treatment is many times that which is required by the X-ray. During all this time a competent attendant must be actually with the case.

The best results from the Finsen treatment are obtained by the direct solar rays and so this method is dependent, somewhat, upon weather conditions. A very serious drawback with the Finsen ray is the limited area that can be treated at a sitting, making multiple treatment necessary, and again increasing the time to cure—there is also danger of reinfection from the uncured part before the whole area can be treated.

Now as to actual results: I have appended a tabulated summary of fifteen selected cases treated by me in the last four years. These cases were selected, not because of the good results, but because of the certainty of the diagnosis. Many, as you will see, were diagnosticated by the microscope, while all those in which the diagnosis was made by clinical evidence had been treated by competent specialists for Lupus, or referred by them to me with the diagnosis so made. In the results given those marked cured the tissue has every appearance of health,

with not the slightest evidence of a return. The skin is smooth, and time enough has elapsed since treatment to assume the cure is permanent. Those marked apparently cured, there is no evidence of Lupoid tissue. but the skin is still a little rough and not as good as in the former class.

This gives an average time of treatment of six months, which, if case 4 was taken out. would be reduced to five months. This case came from a distance and due to poor general health was very irregular in attendance, sometimes being absent for several months.

The average time since treatment was discontinued is over one year and eight months. This seems to be long enongh to make the results probably permanent.

The percentage of cures is 80 per cent, or if case 12 is taken out, 87 per cent. This case I treated, by error, for epithelioma and now the growth, which is small, and in all probability curable when the proper method is applied, is returning. If only the ones with smooth skin are regarded cured, the percentage falls to 75 per cent, which I still consider very good.

THE ULTIMATE RESULT OF THE ROENTGEN TREATMENT OF CARCINOMA OF THE BREAST.

By George C. Johnston, M. D., 611 Fulton Building, Pittsburg, Pa.

A review of the literature of the Carcinoma of the Breast during the last year reveals but little from the pens of those operators whose experience in the use of the Roentgen Ray is great enough to entitle their utterances to respect and attention. On the other hand a number of articles have appeared in the various journals which betray upon their face ignorance and inexperience. One of these writes, after relating a deplorable series of surgical mishaps arising during an attempt to operate upon a breast which had been previously rayed by another operator, accused this preliminary treatment of a number of unpleasant things and ends with a denial of the ability of the ray to produce any tissue changes whatever beyond a dermatitis, basing these sweeping assertions upon an extended experience of six cases. Such articles as this, which is merely an example of a number of others to which my attention has been drawn during the year, are not entirely worthless, since they serve to produce a thrill of amusement and compassion in the minds of those who have sufficient experience to enable them to correctly judge of the value or otherwise of this agent in the treatment of the condition noted, but unfortunately the wide-spread dissemination given such misleading statements by the various journals is liable to lead to a misapprehension upon the part of the profession at large who have but little time to investigate such matters and are apt to lend most attention to the loudest noise. In one such article a technique was employed for deep-seated carcinoma which was exactly suited for the treatment of lupus or superficial epithelioma and diametrically opposed to those principles enunciated repeatedly by the men who have announced certain degrees of success in the treatment of deep-seated carcinoma, primary or recurrent.

The author, in apparent ignorance of the fact that the X-ray possesses no power of independent judgment, after using a ray which is absorbed by the skin, boldly states that from his extensive experience of six cases he has proven that the radiation from an excited Crookes Tube produces superficial effects only and is incapable

of effecting tissue changes at a depth greater than one-quarter inch below the surface.

I do not believe that any false modesty should be allowed to prevent the challenging and direct controversion of such palpable misstatements. It has been repeatedly demonstrated that a capable apparatus in the hands of a competent operator can be made to produce radiations so penetrating that they may be absorbed and rendered effective therapeutically at any depth in the body, in fact the skin of the back may be affected even to the production of a marked dermatitis by radiation directed toward the front of the chest, thus passing entirely through the body. I do not know of any way by which those members of the profession may be taught who persistently ignore and disregard the repeated statements of those physicians who have devoted years to this work and have freely formulated and disseminated exact and explicit directions whereby any other physician of intelligence can reproduce their technique. There are none as blind as those who will not see, and the only defense seems to be the exposure of the dangerous ignorance of such writers who make up for a paucity of ideas with a deluge of words and who base sweeping generalities on individual observations.

The power of the X-ray to affect distinct cellular change upon normal or pathological tissue is in evidence this year as it was last, with the difference that in the hands of qualified men these effects are produced with a certainty, directness and ease which is the natural result of another year's observation and experience. At the meeting of this Society one year ago, I made the strongest plea in my power for the wider adoption of ante and post-operative treatment of carcinoma. The ensuing year has not convinced me of the error of the position then taken, but has only served to strengthen it, and to more firmly ground the conviction that in such ante and post-operative treatment in conjunction with bold and skillful surgery lies the salvation of this class of patients. During the year some disappointments have appeared. Some cases are to be recorded as ultimate failures inasmuch as deep-seated internal recurrence has manifested itself and will probably progress to a fatal termination. Each of these two cases, however, were suffering from recurrent inoperable carcinoma which under the influence of the ray alone disappeared completely, giving the patient over three years of health and happiness. While it is necessary to class these cases as ultimate failures, yet

I think that the results obtained more than compensated both physician and patient for the trouble of taking a few painless treatments. A number of other similar cases have shown no tendency to recurrence. Neither of the cases which recurred were subjected to anti-operative treatment. In both post-operative radiation was only begun when the appearance of marked recurrence forced the adoption of some method of treatment, whereupon the surgeons announced their inability to confer any further benefit by operative procedure. If the X-ray is to be employed in a manner to cast credit upon it as an aid in the treatment of this class of cases, anti-operative ardiation must be insisted upon, but if refused post-operative radiation must be begun coincident with the beginning of recurrence at the latest, and should be employed, where the surgeon will consent, before recurrence has manifested itself, preferable the tenth day after the operation. In every such case the mediastinum as well as the site of operation must be raved.

In no case of primary carcinoma submitted to radiation without operation has recurrence manifested itself, but it must be remembered that in every such case the primary growth had advanced so little that the patient was unwilling to admit the necessity of operation. I am unwilling to believe that the satisfactory result in these cases was due to the absence of operative procedure, but attribute it to the primary nature of the growth and the absence of metastasis at the time of the institution of the Roentgen treatment.

During the year repeated and renewed evidence has appeared of the actual value of the ray in producing retrograde changes in carcinomatous tissue. The adoption of the method of filtration, founded upon principles established by Roentgen and Walter and applied first as a therapeutic aid by Pfahler, of Philadelphia, and value proven clinically and experimentally, has resulted in simplifying the technique and permitting the administration of much heavier doses with consequent increase in the quickness of response of the disease to the ray. The experience of the past year has been thoroughly satisfactory.

The incredulity and antagonism of certain members of the profession in spite of the misleading contradicting reports circulated by the class of observers referred to above has shown a marked decrease. The profession in general are manifesting a healthy interest in the possibilities of Roentgen Therapy and are beginning to ask intel-

ligent questions, thereby making the opportunity for explanation and conviction. It should be the duty during the next year of every Roentgenologist to perfect himself in the technique of the treatment of carcinoma; to satisfy himself as to the exact value to be given the method as practiced by himself. Extreme conservatism combined with healthy investigation and repeated observation is necessary in order that we may arrive at a true determination of the exact value of this agent in this disease.

Primary carcinoma of the breast should be treated by the ray alone when the condition or age of the patient presents a strong argument against preliminary operation. The inherent fear of surgery which so many of these patients present must not be permitted to act upon our sympathies or bias our judgment, but the treatment of primary cases must only be undertaken for good and sufficient reasons.

Free discussion of these problems with the surgeon where the Roentgenologist shows his freedom from prejudice are usually productive of good, since when the surgeons become convinced of the actual value of the ray in preventing or retarding metastasis they will insist that their operation be aided by such profilactic measure.

Bold assertions of the ability of the ray to cure carcinoma wherever situated without recourse to surgery carry not conviction but contempt to the majority of the hearers, and it must be remembered that an assertion of fact and a demonstration of fact are two widely different things.

While the writer is daily more convinced of the actual assistance which the ray is capable of affording in the treatment of carcinoma he is also more than ever certain that extreme conservatism of statement combined with practical demonstration of actual result is the best way to convince the profession of the ultimate value of radiotherapy intelligently administered as an aid to surgery, not a substitute in the treatment of carcinoma.

Conclusions:

1. Results are better and more permanent the earlier treatment is instituted.

2. The value of post-operative radiation has become more and more apparent.

3. Mediasteinal recurrence, while grave, is not a death warrant.

4. Technique is not an accomplishment, but an absolute necessity.

5. No tube is too good to use for treatment.
6. Filters are a necessity in the treatment of cancer of the breast.
7. Treat no case that you know can be cured surgically.

GENERAL OBSERVATIONS OF DIFFERENT WRITERS AS TO THE EFFECTS OF THE X-RAYS UPON HAIR AND OTHER TISSUE ELEMENTS.

By Wm. S. Newcomet, M. D., Philadelphia, Pa.

While undertaking to review this subject, it would be well to preface this article by the fact that it is not strictly from a dermatologic standpoint, although it does invade rather freely, and in apology it might be said here that there is no field in medicine which is so broad as is ours, for it practically interlinks all the special branches of medicine.

One of the very first observations made as to the effect of the Roentgen Ray upon tissues was in regard to the loss of hair that often followed its use, and as several well-known writers and experimenters aspire to priority, it must be admitted, no doubt, that it was made simultaneously by many, although at that time it was not deemed worthy of record. Yet at the same time that the subject is an important one is well emphasized by the statement of Sabouraud, where he estimates a saving of 1,500,000 francs a year in the department de l'assistance brought about by the rapid and efficient relief in cases of ringworm only. This fact, coming from such a source, shows plainly that if these rays are properly handled they will be of use to the dermatologist as a method for the rapid and painless removal of hair in such cases where the cure of the disease demands this treatment.

At the present time our knowledge as to the effect of the X-ray upon all tissue is rather confused, but from the mass of testimony some facts seem to predominate, the one that concerns this subject most is that it evidently has a selective tendency for the epithelial elements and it would appear that the hair seems to be the most susceptible. Some have stated that the higher the epithelial structures are specialized the more susceptible they are to the ray, but this can hardly be true, for more than one observer has called attention to the resistance

of the widely different and highly specialized structures in the eye. Others have stated that it is due to blood supply of the part, but this is also open to many objections. Under all conditions of inflammation the epithelial structures are first to suffer, and if scar tissue results fibrous tissue usually replaces it, at the same time fibrous tissue is last to give way in an inflammatory process. All that can be said is that the ray has a selective tendency for certain cells. This fact is brought out clinically, but so far we have very little evidence from a microscopic standpoint that will aid us toward determining the exact status of this point.

Pusey in his book has summarized the effects of the X-ray as follows:

1. The X-ray influences especially or exclusively the cellular elements of the skin. These are influenced primarily and undergo a slow degeneration, while the connective tissue elements, the elastic tissue masculature and cartilage are changed only to a slight degree, and suffer only secondarily, as a result of the cellular degeneration, and the inflammatory reaction consequent to it.

2. The degeneration affects the epithelial cells in the highest degree and to a less extent the cells of the glands, the vessels, the muscular tissue and the connective tissue.

3. The degenerative appearances are of various kinds and affects both the protoplasm and neuclei.

4. As soon as the degeneration has reached a certain point an inflammatory reaction appears which manifests itself with gathering leucocytes and marked emigration of the blood corpuscles, when greater cell degeneration occurs, as a result of stronger exposure.

5. The changes in the large and small vessels are apparently of great importance, as affects the further development and slow healing of the ulcerations.

These conclusions in no way explain the many widely different observations that have been reported in regard to the effects of these rays upon the hair. Clinically we know the hair can be removed, but how this is accomplished is still unknown, as we have absolutely no distinct pathologic degeneration which we can ascribe alone to the X-ray. Another fact that we know from a clinical standpoint, and can be stated with a degree of certainty, is, if too much X-ray has not been given to the part, that after the hair has been removed, in certain length of time, the growth of hair will recur and literally no change can be noted in its appearance; but here comes in the

factor of the variability of the dosage and in consequence a change in the future growth. Cases have been reported where the loss of hair was permanent or in some instances a slight loss in amount; gray hair has been restored to its original color, in some cases there has been a change of structure, as thin hair has come in coarse, or straight hair has afterward been curly or kinked; again there has been an increase in the amount of hair, and even in cases of baldness at the advanced age of 80 years.

Now when we consider that the range of power of this agent is from a complete removal of all hair on a spot where it is growing, to the growing of hair on a spot where it has been absent, it can easily be seen just how confused the whole subject must be, but the problem depends upon two points. First, the application of a very mild X-ray usually acts as a stimulant to the hair cell, while secondly, strong currents destroy them, the amount of permanent damage depending wholly upon the amount of injury to the cell elements inflicted by the burn.

If these two rules are correct, then it would seem that it was an easy matter to either grow or remove hair, just as the occasion required, but while these two primary rules may be correct in theory, the application is an entirely different matter. Here we have to contend with two important factors upon which we can never depend for constancy. First, the variation of the quantity and quality of the X-ray, although to a great extent this can be controlled; while secondly, the personal idiosyncrasy of the patient. At the same time different localities on the same person must be considered Dalous and Lassere contend that certain forms of epithelium are more sensitive to the X-ray than others; for instance, the squamous epithelium resist the X-ray to a greater extent than the columnar type, and while this may explain to some extent the resistance of different tumors, it does not, however, account for that most annoying and widely different variability of the personal equation.

Various methods for measuring the amount of X-ray that a given patient receives have been recommended to overcome this difficulty, and taking it for granted that the physical part of this idea is correct, we have not advanced one point toward its solution. Therefore in all our cases we must proceed with care, otherwise unexpected and undesired results will be likely to follow. The method of obtaining the desired result

in one treatment, as is recommended by some, should be condemned as dangerous, and while the administration of the X-ray is slow and often tedious if one has many cases he may treat several at the same time, either by using a number of tubes or else by a screen, seating four cases at one sitting. This not only saves the operator's time, but is a decided point in economy. The only point to be observed is the proper selection of cases, although this can be modified by placing leather over the window of the screen.

In treating the class of cases under consideration a fairly low tube should be used, as very little penetration is needed, and to obtain the desired result simply vary the time of exposures. Here we may divide our cases into three groups: First, those where the desire is to promote the growth of hair, as in alopecia. Second, where only a temporary loss of hair is desired, as in sycosis, favus, etc. Third, where the desire is for a permanent loss, as in hypertrichosis.

In the first group of cases great care must be observed not to give too much X-ray, as only the slightest stimulation is to be desired. Upon the appearance of the slightest erythema the treatment should be stopped and not commenced again for a month or more after the subsidence of all symptoms. In most cases of alopecia short treatments of one or two minutes from a rather weak tube given about once or twice a week will accomplish the desired result. This mode of treating these cases has not met with the general approval of most dermatologists, and as many believe that the majority of cases of alopecia recover in time, they do not approve of a method attended with so much risk.

In the second group of cases we wish to remove all hair temporarily. This must be done thoroughly, otherwise the result will be a dire failure, and in these cases it is better to carry the treatment too far than not far enough. While the hair usually falls easily, there is very little chance of its complete destruction, if as stated the slow method is employed. Bad burns are those that have been caused by a few heavy exposures; they ulcerate early and heal very slowly, often two or three years in duration, while those burns that result during X-ray treatment from an excess of the ray usually heal in a month or so and rarely give annoyance. Therefore, while it may show a great refinement in technique to be able to accomplish the removal of all the hair satisfactorily in one sitting, it must be admitted that it is attended

with some risk. The following cases serve to illustrate this point:

About two years ago a series of skiagraphs were made of the head of a young girl, 15 years of age. She was a blonde and rather anemic. Four exposures inside of a half hour; the time consumed during the taking of the pictures was about four minutes, equally divided between Muller and Fredlander tubes. They were energized by a 20-inch coil, 110 volts, electrolitic interrupter 20 amperes, spark gap resistance about 4 inches; anode was 18 inches from the plate, the surface of the head varied was the different positions. On the morning of the fifteenth day after the exposure the patient's mother started to comb her hair, when with the first stroke of the comb all the hair on the crown of the head was completely removed. No sensation was experienced by the patient. However, a month later this spot was covered by a fair growth of hair, arying from a quarter to a half-inch in length.

Case 2. A young man 24 years of age suffering from sycosis, parasitic, was given several treatments under the upper lip. After the last treatment there followed the most intense reaction, seeming almost to be erysipelas. About a month later after all symptoms had subsided, the X-ray was again applied with the same result. It was after the last series of treatments that he came under my care, and wishing to try this mode of treatment for myself, the good points were explained and so on, but the patient absolutely refused.

These cases illustrate the need of great care in handling the X-ray, and while it is in this class that the most brilliant results are to be expected.

The third class, where we desire the permanent loss of all hair, has not on the whole been satisfactory, although in some instances cases have been reported where the result was all that was to be desired, although in the average case the hair will recur except where there has been considerable destruction of the tissue elements, and this accident is one that should be avoided. In those instances where the hair does recur it is far better to treat several times or as often as required rather than produce a severe burn.

In conclusion it might be said that this field of the X-ray has hardly been considered in medicine, while the opportunities it offers for brilliant results are far better than many others, but when the operator does employ this agent he should above all other things be sure of

his diagnosis and then on the other hand be extremely careful not to allow the treatment to get beyond control. And the old adage "That poor results live long in memory, while the good ones are soon forgotten," is as true here as in any other place.

REPORT OF TUBERCULOUS ADENITIS TREATED WITH THE ROENTGEN RAYS.

By Russell H. Boggs, M. D., Pittsburg, Pa.

Case 1. Five years ago, when I began to treat the first case of tuberculous glands, by the Roentgen Rays, it was with the idea of checking the disease and giving the patient temporary relief. I was agreeably surprised to note a rapid improvement, and in three months the patient was apparently cured. Her family physician, Dr. R. J. McCready, has informed me, within the past month, that she is still in good condition and that there is no sign of recurrence.

This patient had been operated on six months before the case was referred to me. Prompt recurrence followed and the glands were breaking down when X-ray treatment was begun. This was my oldest case and shows how lasting these results may be.

Case 2. Mr. B., aged 23 years, had been advised to have the cervical glands removed, as they were rapidly increasing in size. Since the patient would not consent to an operation, I gave him four treatments of 20 minutes each with the tube placed at 12 inches, and a slight dermatitis occurred. Then the danger of an X-ray burn frightened him and he refused to take further treatment. This amount of radiation, however, checked the enlargement, and the glands are smaller and harder at present than they were four years ago when these treatments were given. This case is of interest as an early case in which dermatitis was produced in a few treatments and was followed by lasting results.

Case 3. Miss S., aged 18 years. referred by Dr. J. Shanor, had a tuberculous mass in the right side of the neck, and part of the cervical glands were breaking down. The patient had undergone an extensive operation nine months before X-ray treatment was begun. X-ray treatment was given three times a week for two months. at the end of which time the skin became so much inflamed that it was necessary to discontinue raying for three weeks. A series of 18 treatments was again given, and

when the second dermatitis cleared up, the greater portion of the mass had disappeared. That portion of the mass which was left was very hard but freely movable.

A consultation was held and she was advised to have the remaining portion excised. This she refused to have done. At present her condition is about the same as it was four years ago, when the last treatment was given. Although this patient is not absolutely cured, the result was very satisfactory, as the case was a desperate one. It is now three years and nine months since the last treatment was given.

Case 4. Mr. H., aged 19 years, had tuberculous glands of the right axilla. A diagnosis was made and the removal of the glands was advised by a surgeon. Seven treatments, of 20 minutes' duration, were given with a medium tube placed at 10 inches, which produced a marked dermatitis. This was followed by suppuration of the glands. Dr. McCready incised the suppurated glands, which apparently cured the patient. Three years and six months have elapsed with no sign of recurrenec.

Case 5. Mrs. W., aged 33 years, was referred by Dr. Maurer two years ago for X-ray treatment of a tuberculous mass about the size of a hen's egg, in the right axilla. The cervical glands were also slightly enlarged. When the patient came, the sputum was examined several times, and found to contain tubercle bacilli. The patient was treated three times a week for three months and then irregularly for two months longer, when the entire mass in the axilla disappeared. No tubercle bacilli were found in the sputum after three months' treatment. Up to the present time there has been no recurrence.

This case emphasizes the value of including the apices of the lungs in treating cervical glands.

Case 6. Miss M., aged 16 years, had lupus vulgaris of the right cheek, which had been cauterized a number of times. About six months before the patient was referred, the glands in the neck began to enlarge and several of them were as large as a hickory nut. This was the most obstinate case of tuberculous glands I have treated, and it was only after intense irradiation that the glands were reduced perceptibly in size. It is two years since the last treatment; the glands are normal, but there has been a recurrence of the lupus.

Case 7. Miss B., aged 38 years, had the cervical glands removed two years ago last April by a very complete operation, the line of incision extending from the

mastoid process to the clavicle. A recurrence followed two months later. Thirty-two treatments reduced the glands in size, made them very freely movable and very hard. The condition remained about the same until lately, when one of these hard nodules began to enlarge. It is a question whether it would not have been better to have had these hard nodules extirpated. One naturally assumes that a recurrence coming after such a long period of quiescence might have been prevented by removal of the walled-off foci that the hard nodules appear to contain. Removal without radiation, on the other hand, would probably have been followed, as in the first operation, by prompt recurrence. Possibly the treatment was not carried far enough. It is often difficult to decide when to discontinue treatment.

Case 8. Miss B., referred by Dr. McClelland, had been operated on, and as the recurrence was slight, 20 treatments caused a disappearance of the disease.

Case 9. Miss D., aged 21 years, was referred by Dr. Herron for tuberculous adenitis. After 35 treatments the inflamed glands disappeared, a single hard nodule remaining, which was freely movable. The patient remains in good condition after one year.

Case 10. Mr. H., referred by Dr. Nettleton, had been operated on for cervical adenitis, which later recurred. In the line of incision a keloid appeared. Thirty treatments apparently cured the glandular trouble and caused almost complete absorption of the keloid. At present the patient is apparently well and has returned to college.

Case 11. Miss M., aged 20 years, referred by Dr. Duff, had been operated on four times for tuberculous glands, and when she came for treatment, both cervical and axillary glands were involved. Twelve treatments were given in 1904. Then the patient left the city for three months, and while absent took a few X-ray treatments, which held the process in abeyance. When she returned, intense radiation, with the tube placed at 12 inches was given until a dermatitis was produced. Treatment was given in series for four months, when the patient was apparently well. Where the glands were of the largest size, there remained a small fibrous nodule. The patient is still in good condition.

Case 12. Mr. R., aged 25 years, referred by Dr. Cameron, had been treated by mild doses of the X-ray when the tuberculous glands were first noticed. Later the glands were removed, and afterward recurred. Three months of X-ray treatment caused a disappearance

of these glands. Nine months later the disease recurred and the patient was operated on last July, and as yet has not returned for post-operative treatment. The histological examination of these glands showed no tuberculous tissue remaining and led the surgeon to doubt the diagnosis.

Case 13. Miss B,. aged 18 years, underwent an extensive operation six months before coming for treatment, the line of incision extending from the mastoid to the clavicle. There were two masses, each about the size of a hen's egg. It was with difficulty that she could move her neck, and she was very much emaciated. After nine treatments she became more comfortable and began to improve in general health. The glands were greatly reduced in size. Sixty treatments were given in six months, when all the smaller glands had disappeared and the two larger masses were about the size of a hickory nut, hard and freely movable.. The treatment was then discontinued. It is now a year and a half and the patient has remained in good health until the last two months. After a long period of hard study and close confinement, she now appears to be developing pulmonary tuberculosis. although the nodules remain stationary. The patient in this case went into the country for a time, and when she returned she was greatly improved and is at present in good health.

Case 14. Miss G., aged 25 years, referred by Dr. Wertz, had tuberculous glands on the left side of the neck, and an operation had been advised. Irregular treatments were given from March to June, 1906, with considerable improvement. Then the patient discontinued treatment and expects to begin again this month.

Remarks.

Three other cases were treated, but only a few times. These were irresponsible and no later record of them can be procured. .....

In all the other treated cases a dermatitis was produced, and in most instances this was well marked. At present, by the use of filters, the same results can be obtained without producing much reaction of the skin.

A tube placed from 12 to 15 inches which reads "4" plainly on the Walter skiameter, with 1½ to 2 milliamperes of current passing through it, should be used in beginning the treatment of tuberculous glands. After the glands become smaller and harder, a tube which will read "5" on a Walter skiameter is better. A piece of

aluminum should be placed in front of the tube to filter out the softest, or derma, rays which are injurious to the skin and have no action on the glands. When possible, I believe it advisable to treat these cases daily, placing the tube at a greater distance from the skin.

The error in tube distance seems to be made very frequently and the reason is that it requires so much light to produce the desired effect with the tube placed at the proper distance. Many tubes will not maintain a uniform vacuum when 1½ to 2 milliamperes are passing. With the tube placed at 12 inches from the skin, showing a penetration of "4" on a Walter sklameter, 1½ milliamperes passing, and with an exposure of 20 minutes three times a week a mild erythema will be produced in from three to four weeks.

A review of these cases shows a remarkable predominance of mild dermatitides in cases in which permanent results have been obtained. This shows that the treatment must be energetic to be beneficial, and a mild dermatitis is not too much to pay for a successful result. The production of a dermatitis is however, a matter of much consequence, especially in the treatment of non-malignant disease, where cosmetic results are expected. A mild dermatitis is compatible with such a result, but a severe dermatitis must be guarded against. Equally good results, with less dermatitis, can be obtained by the employment of aluminum protecting screens.

In speaking of technique, it is only possible to give the average: technique must vary with the individual case and adapt itself to the necessity of the case if successful results are to be obtained. The guide to this variation must be the experience of the operator in the treatment of tuberculous glands.

The results obtained by the Roentgen Rays will compare favorably with those of any other method in the treatment of tuberculous glands, as a large number of the cases can be apparently, if not permanently, cured. While it would be too much to state that permanent cures have been effected in any of the cases here reported, it has been apparent that several of the cases have been seemingly cured, after a period of four years with no recurrence.

Improvement was not as a rule obtained until after at least 12 treatments, although there were some exceptions, one yielding after four, and others not until 25 to 30 treatments had been given. Permanent cures should

not be expected until after treatment for at least three months.

DISCUSSION ON PAPERS BY DRS. JOHNSTON, NEWCOMET, VAN ALLEN AND BOGGS.

DR. KENNON DUNHAM, Cincinnati, Ohio.:—I was very much interested in these papers because each of them presented something new. One thing that appeals to me particularly is Dr. Johnston's work on carcinoma of the breast. It has seemed to me that a most faulty procedure in operations for cancer of the breast was tightly closing the wound before the formation of granulation tissue. It would be much better to take the breast off, leave the wound wide open and then cover it with silver foil, thus leaving a large surface for irradiation. The granulation tissue probably would assist in preventing metastism. The procedure which we allow the surgeon to execute, removing the breast and then suturing the wound up tightly, and then raying, does not give us so much of a chance to do effective work, and thus gives the patient less of a chance to live. That is the reason why I devised the method of cutting out a good deal with electrolysis.

The practical point is, that I believe that in cancer of the breast, postoperative treatment would be much more valuable if we could get the surgeon to leave the wound open for irradiation, closing it later by skin grafts if necessary.

DISCUSSION ON THE PAPERS OF DRS. JOHNSTON, NEWCOMET, VAN ALLEN AND BOGGS.

DR. WILLIAM H. DIEFFENBACH, New York City.:—I wish to corroborate the temporary success attained by Dr. Gray in his case of malignant disease of the bladder, although the usual time will have to be awaited before the final results can be stated.

A case was referred to me by Dr. Burk Carleton, New York, one that had been diagnosed as a case of papilloma of the bladder. A suprapubic incision was made and as much of the growth was removed as possible. A pathologist subsequently diagnosed the tissue as a papilloma with commencing carcinomatous degeneration. The case was considered a hopeless one, as all of the tumor could not be removed, and it was suggested that the use of the Roentgen ray might prolong the patient's life.

I used a very hard tube and rayed the patient on and off for over five months, and a systematic cure resulted up to date. We should not consign these patients to death without attempting to do something for them. Although a metastasis may occur later, still that remains to be seen.

There is one thing that I have observed in the treatment of hypertrichosis which Dr. Newcomet did not mention, and that is, after persistent raying, we may get a fairly good cosmetic result, but very frequently we get a wrinkling of the skin, which may turn out to be worse than the original hypertrichosis. These patients have the appearance of constantly smiling and they look rather odd. This appearance is caused by the excessive amount of X-ray required for the treatment of hypertrichosis, causing an atrophy of the exposed tissues.

I have used in the treatment of both lupus vulgaris and tubercular adenitis a unipolar X-ray tube, which, I think, especially over small areas where it can be applied readily, gives us better results than does the ordinary X-ray tube. I would like to suggest that you employ this tube for some of the very small lesions which can be treated readily in that way. These mono-polar tubes can be energized from the Tesla, D'Arsonval or Oudin high frequency currents and in addition to the mild Roentgen ray gives off high frequency sparks which, in our opinion, assist in the resolution obtained in these cases.

DISCUSSION ON PAPERS OF DRS. JOHNSTON, NEWCOMET, VAN ALLEN AND BOGGS.

DR. GEORGE E. PFAHLER, Philadelphia.:—As to the treatment of tubercular adentitis. I have cases that have been well for several years. The results have been most encouraging. There is one class of patients with which we must be careful, where a gland is just about to break down. That gland should be excised first and emptied before beginning treatment, or the radiographer will get the credit of really having increased the disease rather than of causing it to disappear.

There is one case that has been referred to so many times indefinitely. It was referred to by Dr. McCollim yesterday and by Dr. Taylor in the Surgical Society in Philadelphia, where he reported the case. At the same time he reported a case of carcinoma of the breast treated by Dr. McCollim, he also reported a case of tubercular glands occurring in a child treated by me. There were unfortunately no X-ray men there to present the other side of the problem. That case came to me with a red tender spot over one of the glands. The child was a physician's daughter and he was very anxious not to have the child's neck scarred. I told him that I thought the gland would break down, but went on with the treatment, hoping that the gland would be absorbed. It did not become absorbed, but broke down and that led to this operation and the severe criticism of the preliminary treatment with the X-ray.

That case teaches much. If the tubercular gland had not broken down, or if we had opened that gland and then gone on with our treatments the case would have gotten well. The very statement that Dr. Taylor made that the lymph channels were obliterated. shows that the patient could have been cured and the child would have been saved the scarring of the neck. And that same argument applies to other lines of treatment. It is really an argument in favor of this treatment rather than against it.

DR. JOHNSTON, closing the discussion.:—In regard to tubercular adentitis. I have written more than I should have written on that subject. I enjoyed Dr. Boggs' paper very much. His conclusions, in my opinion, are correct. Dr. Pfahler's conclusions in regard to these cases which should be treated surgically, I believe to be correct. My experience has proven them to be correct. My experience in the treatment of tubercular adenitis with the Roentgen ray has been very satisfactory; I am treating more cases today than I did in the past three years. Several of the patients were physicians and they have been well satisfied with the results obtained. The others are mostly the immediate relatives of physicians.

There is at present no surgeon who can do a complete dissection of the deep cervical glands down as far as the mediastinum, and remove all the infected glands in a case of well marked, deep seated tubercular adenitis. An operation which does not remove every lymph gland and channel down as for as can be traced into the mediastinum is an incomplete operation. And an incomplete operation in any glandular trouble might just as well not have been performed at all, except when it is done for the removal of such glandular tissue as has progressed so far that suppuration is imminent, impending, and inevitable. Otherwise operation is absolutely contraindicated.

DR. NEWCOMET, closing the discussion on his part:—I think that many cases reported as cured have subsequently recurred. Where severe burns have been produced in cases of hypertrichosis, the results from the tissue changes are often worse than the presence of the hair.

THE ACTION OF THE ROENTGEN RAYS UPON THE NERVOUS SYSTEM.

By Prof. Carlo Colombo, Rome, Italy, Professor of Physical Therapeutics in the Royal University of Rome, Manager of the Central Institute of Physical Therapy.

Many radiologists, from the very first days of Roentgenology, have remarked the nervous disturbances occasioned by the radiations from the Crookes' tube, and they have attributed the cause of such phenomena—as of many others whose nature at the time was unknown—to most dissimilar agencies. Some traced them to the oscillating Herzian field that radiates from the Crookes' tube, especially when hard; others to the fluorescent cathodic rays that come through the walls of the tube; others to the specific action of the Roentgen Rays properly so-called; others, finally, to extraneous causes, as the uncomfortable position of the patient during the radiographic poses, which at that time were very long.

The phenomena were nausea, headaches, delirium at night, cramps, anaethesia, abortion and sometimes paresis and paralysis of the limbs occurring when patients had been long exposed to the X-rays.

Confronted with phenomena of such gravity, scientists sought an explanation from experiment, and many animals were sacrificed to this end. Rodet and Bertin Sans were able to provoke cramps, paralysis and death in 14 days, in the case of little animals exposed to the X-rays. Examining them after death they found meningo mizelitic alterations through all the regions of the

cord irradiated, also cellular hyperplasia and even some little hemorrhagic foci. This meningo mizelitis was certainly not of septic origin, because the bacteriological examination of the blood, of the cephalo-rachidian liquid and of the marrow gave a negative result.

Futassy has reported cases of paresis of the extremities, followed by death, in small Guinea pigs and rabbits that he had subjected to Roentgen irradiation. Oudin, Barthelemy, Darier and Ogus have also noted cases of paraplegia in small animals.

Kienbock found analogous phenomena in the case of rats, but he did not get the same results with Guinea pigs.

Scholtz, too, in one case, observed paralysis in a rabbit exposed to the X-rays. Ficinsky, in the case of Guinea pigs, found degeneration of the lateral cordons and of the gray substance of the posterior coruna of the cord. Finally Danysz found lesions of the nervous system in animals, not exposed to the Roentgen Rays, but to radioactive substances.

On the basis of these experiments new observations were made on human beings. Out of the large number of these I wish to refer to the following case of Bertoletti, which is very conclusive, as it has an analogy with the one I wish to report. It is the case of a man affected with ulcus rodeus of the right front-parietal region, who even before signs of cutaneous reaction appeared, was seized suddenly with violent headaches, nausea, vertigo, inequality of the pupil, and various symptoms of meningeal irritation, which passed away, but were repeated immediately upon the resumption of the radiotherapeutic treatment. Whence the writer concludes there was an active action of the X rays upon the nervous centre and upon the meninges, which was confirmed upon examination of the cephalo-rachidian liquid, on the subject of which the writer is specially qualified to judge. The active and immediate action of the Roentgen rays upon the nervous system being thus clearly proved, radiologists and doctors have attempted to utilize it beneficially in the cure of diseases of the nervous system.

The sedative action of the X rays on the pain principle seems undeniable. Neuralgias and neuritis have been relieved and even cured with irradiations from Crookes' tube, by Pusey, Cederholm, Guilleminot, Weit, Bloch, Leonard, Gramegna, and with radium by Darier.

But it would seem we may even count upon a therapeutic action on the nervous centres themselves.

At the Salpetriere Raymond says he cured two cases of syringo-mielia by irradiating the spinal marrow at the right place.

Pescarolo and Gramegna obtained the same result in two cases of syringo-mielia and in two intrarachidian tumors.

Branth claims to have succeeded in cases of epilepsy, Beck in Basedow's disease, Raymond and Zinimern in spinal tabes.

The case I am about to adduce will show once more, I think, the action of the Roentgen rays upon the central nervous system, though taking place in a way a little different from that hitherto observed by the various writers on the subject.

Mrs. A. T., 36 years old, of Massa Maritma, married, with three children. Nervous heritage in the family.

The patient shows all the stigmata of hysteria. As a young girl and a young woman she had frequent attacks of classic hysterical convulsions. Later on, although free from convulsive attacks, she was constantly in a state of some excitability of the nervous system.

On account of a sedentary life and bad abdominal circulation, a condition of marked varicosita of the lower limbs was developed, especially of the lower left leg. The member became dropsical, hard and covered with large brown spots, and from this, after her last confinement, there developed an acute phlebitis, with high fever and with alarming painful phenomena. This happened in 1900. When the acute phlebitis was cured, there remained hard varicose growths, both superficial and deep-seated, and both in the veinous and lymphatic systems, with infiltrations into all the tissues of the leg, cutaneous edema, pigmentation and serious muscular denutrition, so that the patient walked as little as possible.

In this way the evil went on increasing and great varicose ulcers were formed in the inner anterior region of the left leg.

The ulcerations were very painful, especially after medical treatment, of which she had attempted every variety in about five years; but the patient bore all her miseries with great resignation, and had no longer any hope as to the possibility of a cure.

All the same, following the advice of a surgeon, she agreed to have the varicose growths in different places

removed, after which she seemed for the time to be cured; but after a few months the varicose growths reformed both in the veins and in the lymphatics; the leg resumed its former appearance and a great ulcer formed on the inner front part of the left leg, nearly level with the middle of the tibia of irregular form, with transverse diameter, 24 mms. and longitudinal diameter 40 mms. The bottom of the ulcer was hollow, granulous and often bloody, with indentated sloping edges.

In this condition the patient consulted me; and I did not hesitate to recommend mild applications of massage and some appropriate active and passive kinesitherapic exercise, with a view to stimulate the veinous and lymphatic circulation in the limb. I thought it would also be good to add some applications of Roentgen rays to exert a direct influence towards the healing of the ulcer and to calm the pain.

The radiotherapy of varicose ulcers is now admitted by all the most eminent radiologists and dermatologists, and I myself had experienced in other cases its ready and indisputable efficacy.

The irradiation was localized only on the ulcerated cutaneous surface, all the healthy skin around it being protected by a localizer.

The apparatus I use for the production of Roentgen rays is one of the most perfect, and consists of the following:

(a) A Gaiffe transformer with closed magnetic circuit (without interrupter) working by means of the alternate monophasic street current, of 102 volts and 43 periods or cycles.

(b) Two Villard valvules interposed in shunt in the circuit, which separate the two alternating waves, letting only one pass into the tube, always in the same direction.

(c) A Becleie spintermeter inserted in the circuit to indicate the length of the spark gap and, through it, the degree of hardness of the tube.

(d) A special milliamperometer, to measure the intensity of the secondary current that traverses the tube, permitting us, in some degree, to control the emission of the tube itself.

(e) A Chabaud tube with Villard osmoregulator, specially adapted fo rradiotherapy , through the small quantity of rays it emits and through the ease with which the degree of hardness is maintained constant.

(f) A Benoist radiochronmometer, to estimate the degree of penetration of the rays emitted from the tube.

(g) A Labourade-Noire radiometer for the dosing of the quantity of X rays absorbed by the part treated in each sitting.

(h) A Belot localizer, of the latest design, to localize the Roentgen action upon the diseased part alone, and to protect those parts of the body, neighboring or remote, not to be irradiated.

With such a device there is no possibility of any error in the estimation, whether of the degree of penetration of the rays or of the quantity of rays in each sitting projected upon the part under treatment; and we have the absolute certainty that the Roentgen rays have acted only and exactly within the limits antecedently assigned to them.

Our patient then was subjected to radiotherapic sittings by the fractional dose method.

It is well known that there is a group of radiologists, especially French, with Beclere, at their head, who hold the dose in mass to be the best method.

To the part indicated they administer at once the largest dose of X rays recognized as compatible with the integrity of the cutaneous tissues and between one application and another, they leave a sufficient interval (a week) to prevent the accumulation of the successive doses.

But in the case before us, although there was no danger of injuring the skin, as it was already ulcerated, we had two reasons to prefer the fractional doses:

(1) The need of watching uninterruptedly the local and general reaction of the X-rays in so sensitive a patient, and daily to inspire her with confidence in the treatment, by means of a short sitting every day.

(2) The necessity of not exhausting a subject of little physical resistance by means of long and wearying sittings, and the desire to practice the sedative action of the X rays upon ulcerated tissues, at brief intervals.

The patient was comfortably extended on the radiotherapic bed; and to the ulcerated skin we applied the cylindrical tube of the Belot localizer, No. 2, of 40 mms. diameter.

In this way the ulcerated surface was exactly contained within the circumference of the localizing tube, as was also a small extent of its margins, in the longitudinal diameter; while the healthy skin included within the

localizer in the transverse direction was protected by a suitable plate of lead introduced under the localizing tube. The length of the localizing tube was such that the distance of the bottom of the ulcer from the centre of the anticathode of the Crookes' tube was exactly 15 cms. The Crookes' tube was every day regulated, so that its hardness should constantly correspond with 6 degrees Benoist. The quantity of rays administered at every application corresponded to 2 units H., and the sittings were made at intervals of three days. When a total quantity of 12-13 units H. was reached, there was a longer interval of rest.

Altogether 40 H. were administered in 58 days, which gives an average of about two-thirds H. each day.

Considering, however, that the final effect of a dose of X rays administered by fractions corresponds to the final effect of the dose in mass diminished by one-fourth (Belot), the total dose administered by us is reduced to an effective dose of 30 H., or to an average of one-half H. per day.

As is seen, it is a matter of very small doses, inferior to the average dose in ordinary use, not for ulcerated skin, but for whole tissues.

The treatment began on the 27th of February, 1906.

At the beginning the patient bore the treatment fairly well, and on March 13th, 1906, that is, after 15 days' treatment, having received in 5 applications a quantity of X rays corresponding to about 10 H., the ulcer was observed to be less deep, with its surface smoother, with less secretions, and with the edges on the way to healing.

The dimensions of the ulcer were reduced by not a little, the longitudinal diameter measuring 36 mms., and the transverse 21 mms. The oedema of the leg was less pronounced, and the hard and deep-seated growths due to veinous and lymphatic varicosity were giving way under the action of gentle massage and the passive and active exercise of the extremities. The treatment then proceeded with full satisfaction, both to the doctor and the patient.

To avoid the possible too lively reactions at this point I ordered a longer interval of suspension of radiotherapy, continuing, however, the kinesitherapic treatment.

On March 20th the application of the Roentgen ray was recommenced, under the same conditions above described, the same does of X-rays being administered, and the same intervals of repose allowed.

On March 26th, after two applications of radiotherapy, in which about 4 H. were administered, the lady was seized with serious hysterical convulsions, which she had not had for a long time, and which were repeated for three consecutive nights, accompanied by an indescribable condition of nervous agitation. The radiotherapic treatment was suspended and she was treated as her nervous symptoms suggested. The ulcer was treated with oxide of zinc paste and with sedatives.

On March 30th, as the patient was restored, and we did not think there could be any relation between the radiotherapic applications and the nervous manifestations, the X-ray sittings were resumed; but the following night she had still more violent convulsions.

There was a new suspension of the radiotherapy, during which we observed that the local conditions of the ulcer were further improving.

On April 4th the radiotherapic applications were resumed, under the conditions before described, but from that day she complained of severe pains radiating from the ulcer and traversing her whole body, producing in her a condition of extreme agitation and hindering her sleep. As I had faith, however, in the success of my treatment, I continued the applications until the 14th of April, on which day the ulcer measured 18 mms. along the transverse diameter, and 35 along the longitudinal.

On April 29th the patient could no longer endure the burning and gnawing pain which extended from the ulcer all over the body, the nervous agitation that had mastered her, and the insomnia, and she definitely suspended the radiotherapy.

The nervous conditions of the patient became continually worse; there were almost continuous convulsions, and absolute sleeplessness, and the patient writhed piteously upon her bed.

They spoke of shutting her up in an asylum, for there was reason to fear for her sanity, but all at once, just this threat of confinement had a surprising and inspiring effect upon her, and the disquieting symptoms diminished gradually, and the patient could leave for her own town early in June, in moderate health.

Of the ulceration I have not been able to learn anything more, but it is probable it has continued healing.

The nervous phenomena from which our patient suffered appeared suddenly and without presumable cause other than the radiotherapic treatment. Further, these disturbances manifestly followed a course parallel with

the administration of the Roentgen rays, becoming weaker whenever the applications were suspended, and gradually assuming more serious proportion with the accumulation of the successive doses of X rays.

For these reasons we may consider that the cause of the disturbances of the central nervous system in our patient was the radiotherapic application. But at this point we ask ourselves: Was the radiotherapy in this case only an occasional cause or a true determining cause, the only and immediate beginning of the disturbances?

As we have already shown, various writers have proved that the Roentgen rays, applied directly to the spinal cord or to the brain of animals or man, produce indisputable functional and anatomical alterations, even without the cutaneous surface crossed by the rays being affected.

But all these authors have irradiated the nervous centres directly and the action obtained by them is reasonable and perfectly to be explained.

On the contrary, in our case the Roentgenian irradiation was directed upon a part very remote from the nervous centres and localized in a very small tract of the cutaneous surface.

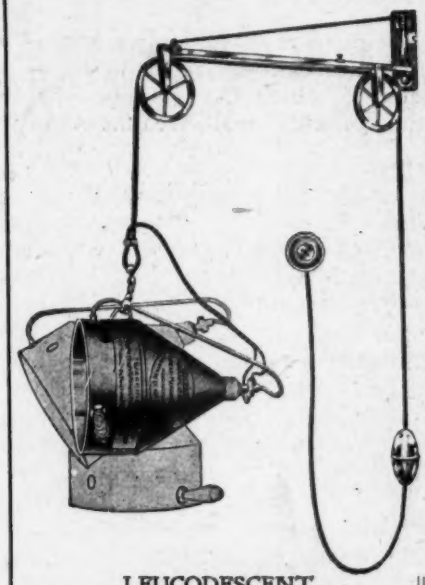
How, then, could the action of the X rays make itself felt in the nervous centres, even as far as the brain?

Here we are met by an earlier hypothesis, based upon Kienbock's theory, according to which similar general disturbances of the organism, accompanied sometimes by fever, headache, delirium, etc., would be due to the absorption of toxin produced by the Roentgenian action upon the cellular elements of the ulceration.

But such an interpretation is not in this case admissible, because in our case there was no fever, and because the extension of the cutaneous lesion was so extremely limited as to render it improbable that it could produce the quantity of toxin necessary to occasion such serious phenomena.

Then, in our case, no other explanation remains except the following, namely: That the X rays, though acting locally upon the ulcer, also indirectly gave a stimulus—through the medium of the sensitive nerve terminations—that extended so far as the spinal marrow and the cerebral cortex, which already constituted the points of least resistance in a neuropathic individual.

So the action of the Roentgen rays was only an occasional cause producing the outbreak—by reflex action—of the nervous phenomena to which the patient was already predisposed by the constitutional weakness of her nervous centres.



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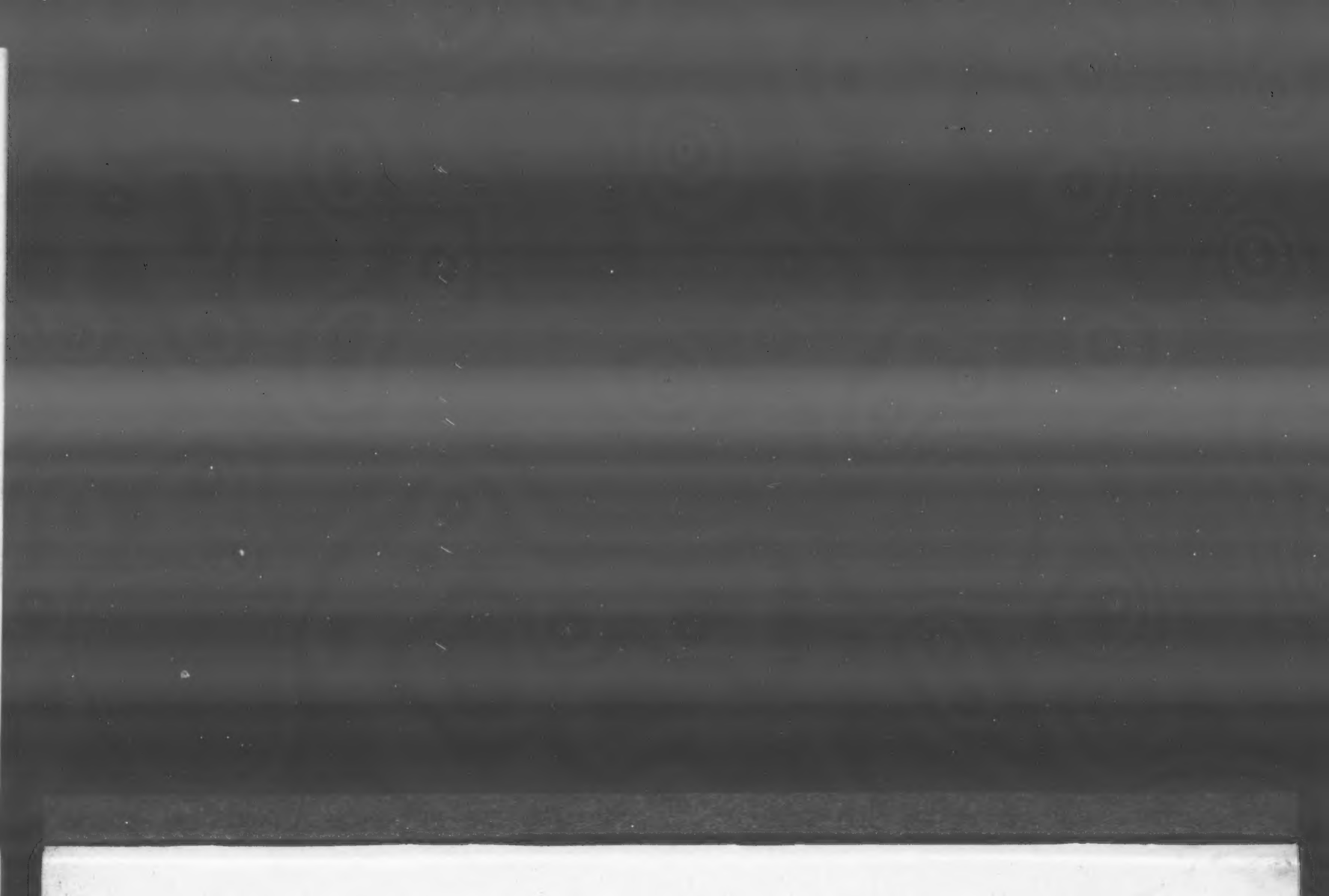

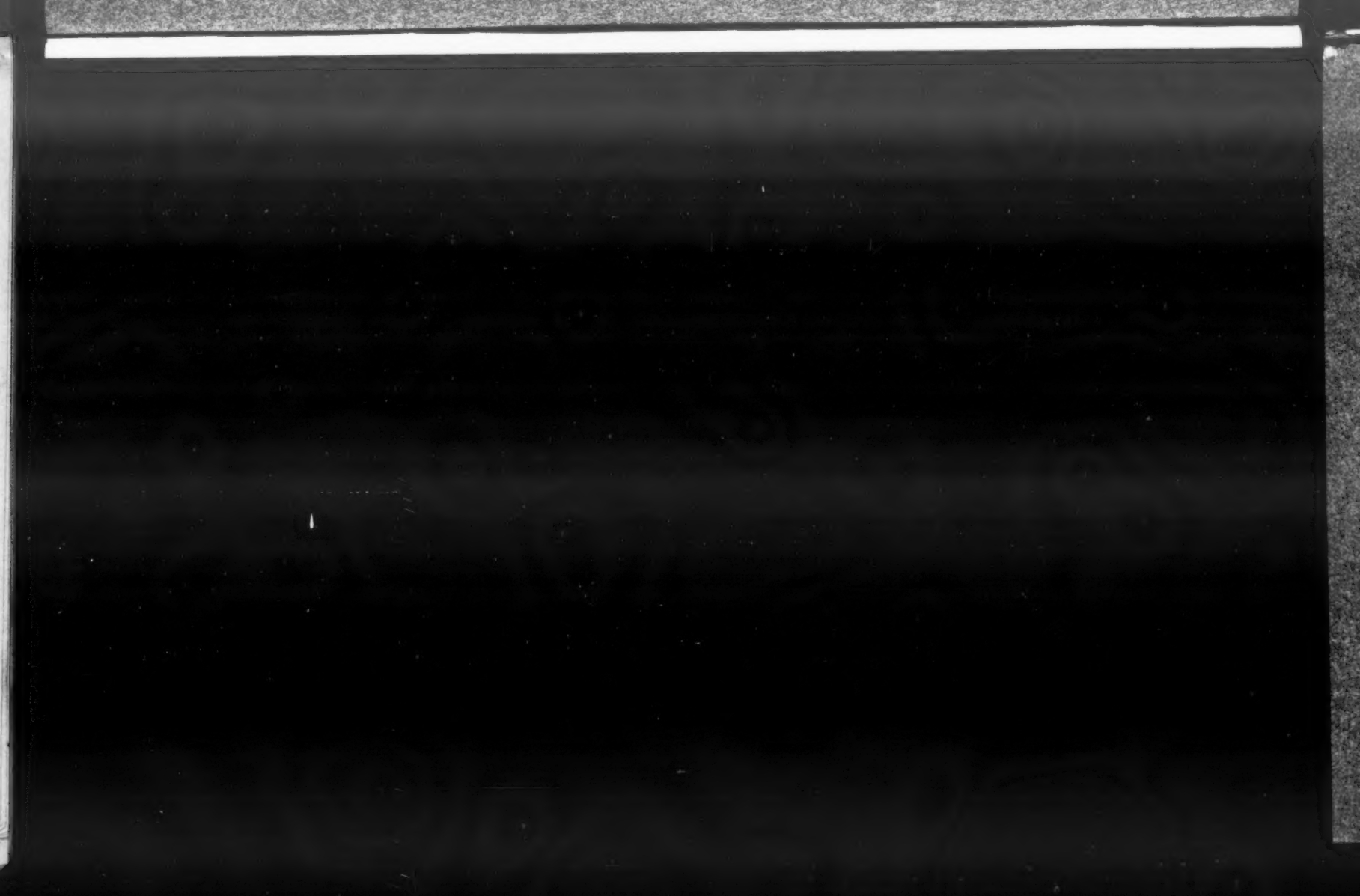

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